

Technical training.
Product information.

F25 General Vehicle Electronics



BMW Service

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General information

Symbols used

The following symbol is used in this document to facilitate better comprehension or to draw attention to very important information:



Contains important safety information and information that needs to be observed strictly in order to guarantee the smooth operation of the system.

Information status and national-market versions

BMW Group vehicles meet the requirements of the highest safety and quality standards. Changes in requirements for environmental protection, customer benefits and design render necessary continuous development of systems and components. Consequently, there may be discrepancies between the contents of this document and the vehicles available in the training course.

This document basically relates to the European version of left hand drive vehicles. Some operating elements or components are arranged differently in right-hand drive vehicles than shown in the graphics in this document. Further differences may arise as the result of the equipment specification in specific markets or countries.

Additional sources of information

Further information on the individual topics can be found in the following:

- Owner's Handbook
- Integrated Service Technical Application.

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The information contained in this document forms an integral part of the technical training provided by the BMW Group and is intended for its course trainers and participants. Refer to the latest relevant information systems of the BMW Group for any changes/additions to the Technical Data.

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F25 General Vehicle Electronics

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1. Introduction

The vehicle electrical system of the F25 is based on the most current BMW models. This training material provides an overview of the most important topics relevant to the vehicle electrical system.

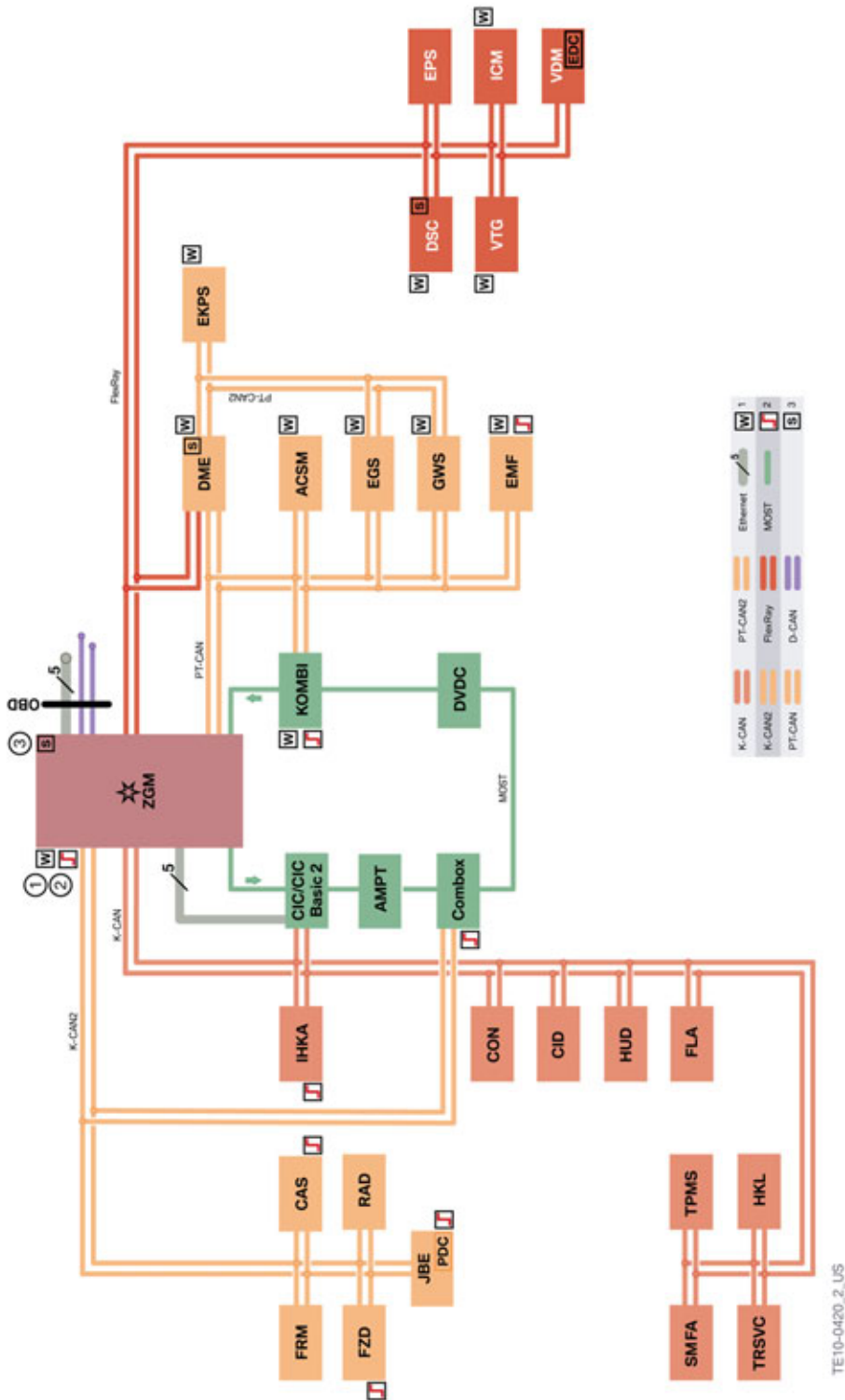
For more information on the various topics, refer to the F01/F02 training material.

F25 topic	F01/F02 information bulletin
Voltage supply	F01/F02 voltage supply
Car Access System	F01/F02 Car Access System.
Comfort Access	F01/F02 Comfort Access
Central locking system	F01/F02 central locking system
Power window regulator	Power window regulators F01/F02
Panorama glass roof	Slide/tilt sunroof F01/F02
Anti-theft alarm system	F01/F02 alarm system
Automatic operation of tailgate	Automatic tailgate activation F01/F02
Exterior lights	Exterior lights F01/F02
Interior light	F01/F02 interior lighting.

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2. Vehicle electrical system

2.1. Bus diagram



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2. Vehicle electrical system

Index	Explanation
1	Wakeable control units
2	Control units with wake-up authorization
3	Start-up node control units for starting up and synchronizing the FlexRay bus system
ACSM	Advanced Crash Safety Module
AMPT	Top HiFi amplifier
CAS	Car Access System
CID	Central information display
COMBOX	Combox (Combox multimedia, Combox multimedia with telematics)
CON	Controller
D-CAN	Diagnosis-on-Controller Area Network
DME	Digital Motor Electronics
DSC	Dynamic Stability Control
DVDC	DVD changer
EDC	Electronic Damper Control
EGS	Electronic transmission control
EKPS	Electronic fuel pump control
EMF	Electromechanical parking brake
EPS	Electronic power steering (electromechanical power steering)
Ethernet	Cable-based data network technology for local data networks
FLA	High-beam assistant
FlexRay	Fast, preset and fault-tolerant bus system for use in automotive sector
FRM	Footwell module
FZD	Roof function center
GWS	Gear selector switch
HEADUNIT	Headunit (car information computer or car information computer basic II)
HKL	Automatic operation of tailgate
HUD	Head-Up Display
ICM	Integrated Chassis Management
IHKA	Automatic integrated heating and A/C control unit
JBE	Junction box electronics
K-CAN	Body controller area network
K-CAN2	Body controller area network 2
KOMBI	Instrument panel
MOST	Media Oriented System Transport

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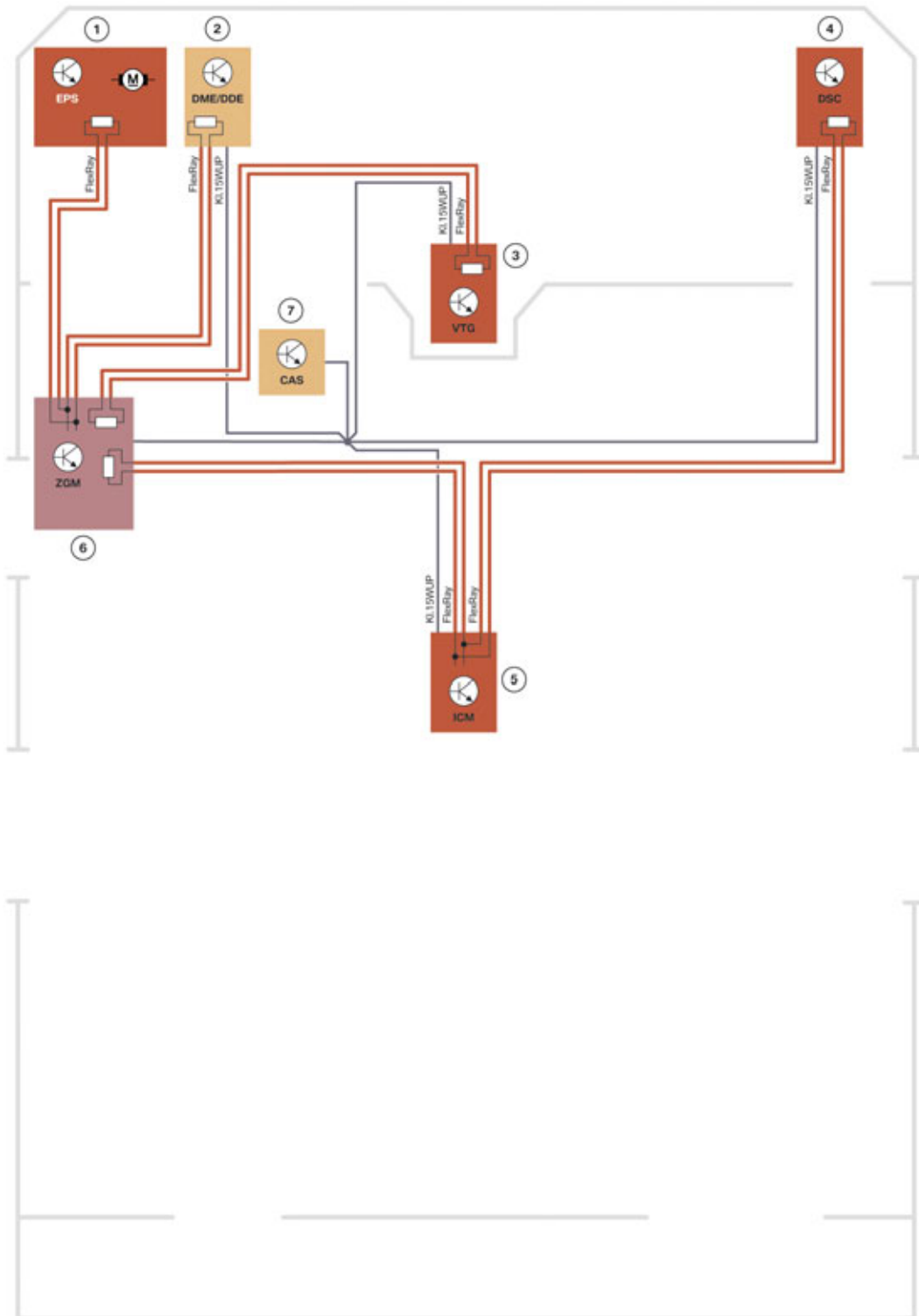
2. Vehicle electrical system

Index	Explanation
OBD	On-board diagnosis (diagnostic socket)
PDC	Park Distance Control
PT-CAN	Powertrain controller area network
PT-CAN 2	Powertrain controller area network 2
RAD	Radio
SMFA	Driver's seat module
TPMS	Tire Pressure Monitoring System
TRSVC	Control unit for camera systems
VDM	Vertical dynamics management
VTG	Transfer box
ZGM	Central gateway module

The FlexRay is shown in a simplified form in the overview of the bus systems. The following system wiring diagram shows the actual physical layout (topology).

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2. Vehicle electrical system



F25 FlexRay system wiring diagram

TE10-1140

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2. Vehicle electrical system

Index	Explanation
1	Electromechanical power steering (EPS)
2	Digital Motor Electronics (DME)
3	VTG (transfer box) control unit
4	Dynamic Stability Control (DSC)
5	Integrated Chassis Management (ICM)
6	Central gateway module (ZGM)
7	Car Access System (CAS)

2.2. Special features

The vehicle electrical system of the F25 is based on the F01 (vehicle electrical system BN2020).

FlexRay is also used in the F25 as the system bus for networking of the systems that control the dynamic handling characteristics and engine control. The central gateway module ZGM contains a so-called star coupler with three bus drives. The bus drivers forward the data of the control units via the communication controller to the central gateway module (ZGM). The FlexRay control units are connected to these bus drivers.

To avoid reflections on the lines, both ends of the data lines are terminated with resistors (as bus termination).

The F25 has Ethernet access in order to be able to program the complete vehicle quickly. It has been possible to eliminate access via the Media Oriented System Transport bus system for programming purposes thanks to the extremely high data transfer rate of the Ethernet (100 MBit/s).

The body controller area network 2 (K-CAN2) facilitates communication between control units with a high data transfer rate (500 kBit/s). The K-CAN2 is also connected to the other bus systems via the central gateway module ZGM.

The Powertrain Controller Area Network 2 (PT-CAN2) serves as a redundant system for the Powertrain Controller Area Network (PT-CAN) in the area of engine and transmission control and also to forward signals to the electric fuel pump.

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3. Voltage supply

The voltage supply concept of the F25 is based on current BMW models. The components and layout used are essentially the same.

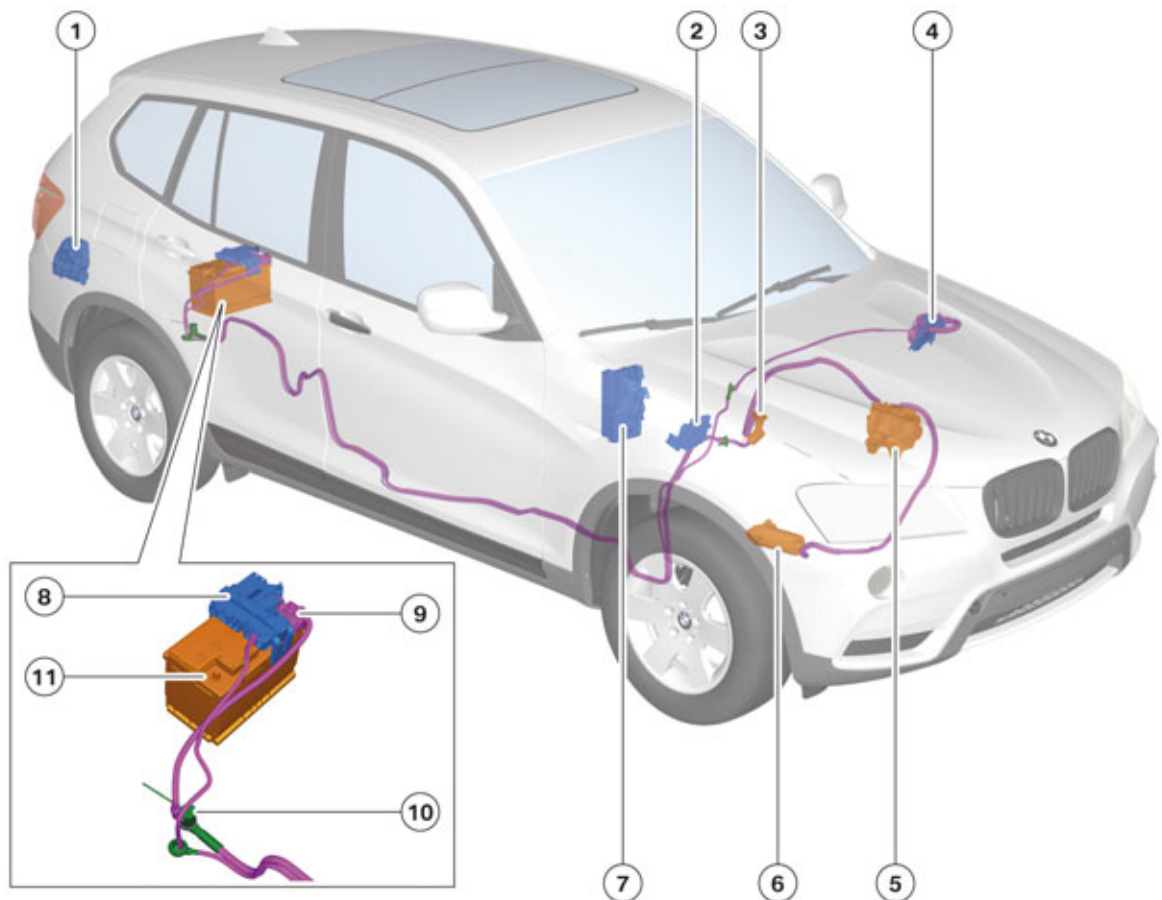
3.1. Components

Due to the steady increase of electrical functions for comfort, communication and safety in BMW vehicles, the voltage supply is becoming ever more important.

Five separate power distribution boxes with fuse blocks are installed in the F25:

- Engine compartment power distribution box with capacitor
- Power Distribution Module PDM at brake servo
- Junction box for the power distribution box in the vicinity of the glove box
- Luggage compartment power distribution box on right-hand side of the luggage compartment
- Battery power distribution box.

The junction box comprises the junction box power distribution box and junction box electronics JBE.



F25 Main power lines

TE10-1135

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3. Voltage supply

Index	Explanation
1	Luggage compartment power distribution box
2	Power distribution box, engine compartment (power supply capacitor)
3	Positive battery connection point
4	Power Distribution Module (PDM)
5	Alternator
6	Starter motor
7	Junction box for the power distribution box
8	Power distribution box on the battery
9	Safety battery terminal (SBK)
10	Transfer point
11	Battery

Two main power lines are routed along the vehicle underbody of the F25 from the luggage compartment to the engine compartment:

- One of the main power lines runs from the safety battery terminal (SBK) to the starter motor and alternator via the engine compartment power distribution box and positive battery connection point. Copper cable with a cross-section of 50 mm² is used up to the transition point below the luggage compartment floor from where round aluminium cable with a cross-section of 80 mm² is used.
- The second main power line runs from the power distribution box on the battery to the Power Distribution Module (PDM) and is a copper cable with a cross-section of 16 mm².

Two additional battery cables run through the vehicle interior to the luggage compartment power distribution box and junction box for power distribution box.

3.1.1. Battery

Voltage in the F25 is always supplied by an AGM (absorbent glass matt) battery. The vehicle battery is installed at the rear of the luggage compartment in the center. Two different AGM battery ratings are used, depending on equipment level.

- 90 Ah
- 105 Ah

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3. Voltage supply



AGM battery

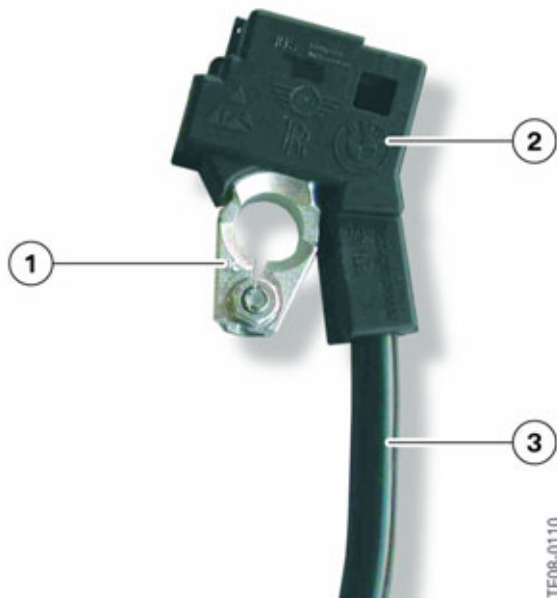
With the introduction of the F10, the intelligent battery sensor (IBS) was used to improve the battery condition detection. The following criteria are used to establish whether or not the battery in the F25 is defective and needs to be replaced:

- Identification of faulty battery cells in the vehicle battery
- Establishing the remaining capacity of the vehicle battery
- Battery water loss detected
- Long immobilization period with low state of charge
- Charge capacity
- Charge balance when the vehicle is at a standstill
- Charge balance when the vehicle is moving
- Lowest permitted discharging

These criteria are recorded using the measured values obtained from the intelligent battery sensor and other measured variables of the voltage supply. Only specific criteria may be used to determine the battery condition, depending on the driving style and equipment used in the vehicle.

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3. Voltage supply



Intelligent battery sensor IBS.

Index	Explanation
1	Negative battery terminal
2	Intelligent battery sensor
3	Battery earth lead

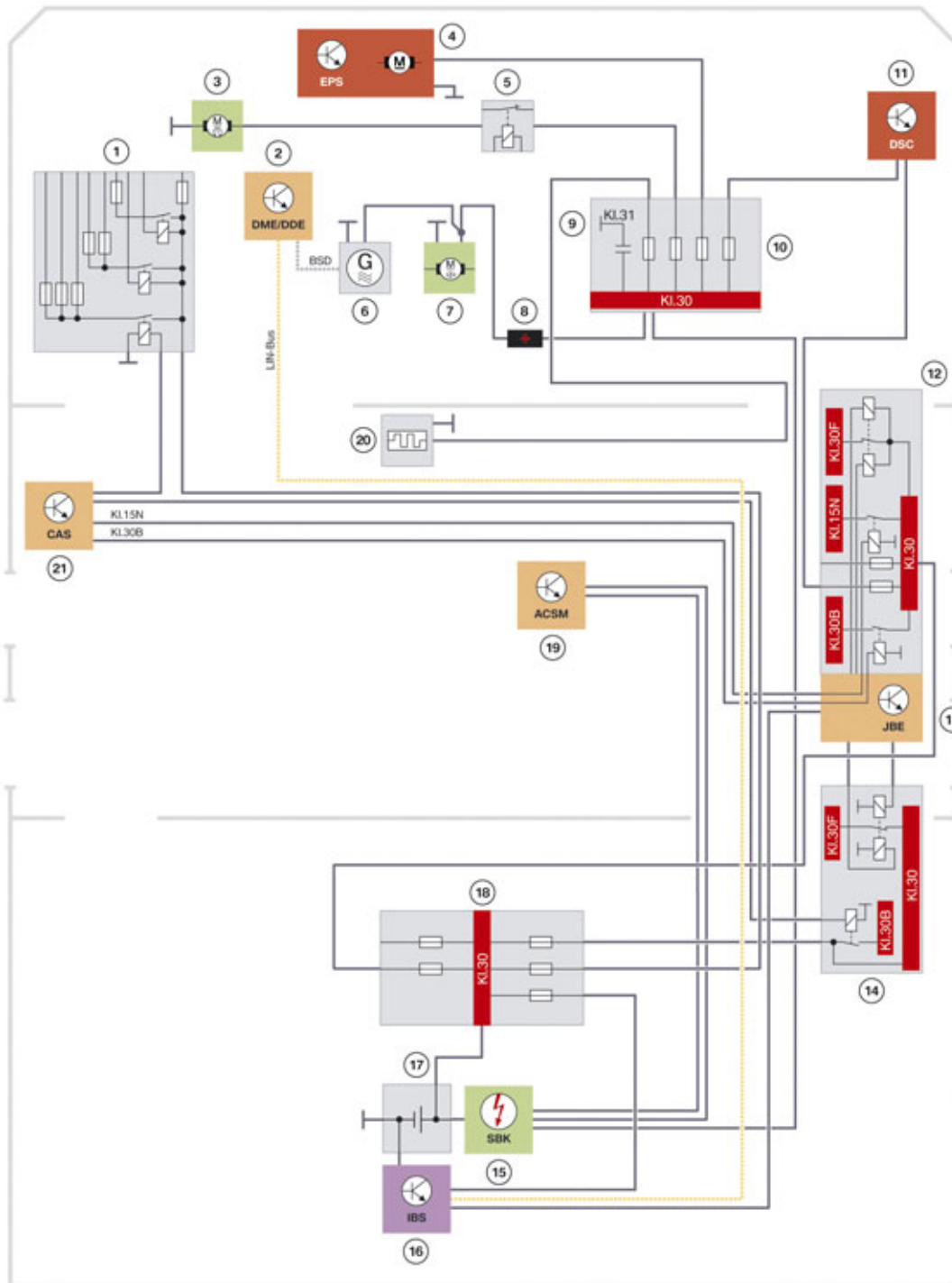
The battery condition detection determines whether the battery needs to be replaced based on the severity and number of defects detected. Furthermore, the vehicle user is notified via the "Check power supply" check control message that a problem may exist. The fault entry can only be deleted once the vehicle battery change service function has been carried out.

The condition of the battery can be read out in Service via the "battery condition" or "energy diagnosis" procedures ("General information / battery" menu) in order to determine whether it needs to be replaced.

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3. Voltage supply

3.2. System wiring diagram



F25 System wiring diagram of voltage supply

TE10-0911

F25 General Vehicle Electronics

3. Voltage supply

Index	Explanation
1	Power Distribution Module (PDM)
2	Digital Motor Electronics (DME)
3	Electric fan
4	Electromechanical power steering (EPS)
5	Relay for electric fan
6	Alternator
7	Starter motor
8	Positive battery terminal
9	Capacitor in engine compartment power distribution box
10	Power distribution box in engine compartment
11	Dynamic Stability Control (DSC)
12	Junction box for the power distribution box
13	Junction box electronics (JBE)
14	Luggage compartment power distribution box
15	SBK safety battery terminal
16	Intelligent battery sensor (IBS)
17	Battery
18	Battery power distribution box
19	Crash Safety Module (ACSM)
20	Electric auxiliary heater (not for US)
21	Car Access System (CAS)
BSD	Bit-serial data interface
Kl. 15N	Ignition (engine after-run)
Kl. 30	Terminal 30
Kl. 30B	Terminal 30, time-dependent
Kl. 30F	Terminal 30, fault-dependent
Kl. 31	Ground connection
LIN-Bus	Local interconnect network bus

3.3. Energy management

The F25 energy management has been extended to include a number of functions.

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3. Voltage supply

3.3.1. Charge condition display

If the F25 is in transport mode, the battery's state of charge is continuously displayed when in operation. The carrier can therefore charge the battery on time in order to prevent deep discharging of the battery, and therefore damage to the battery.

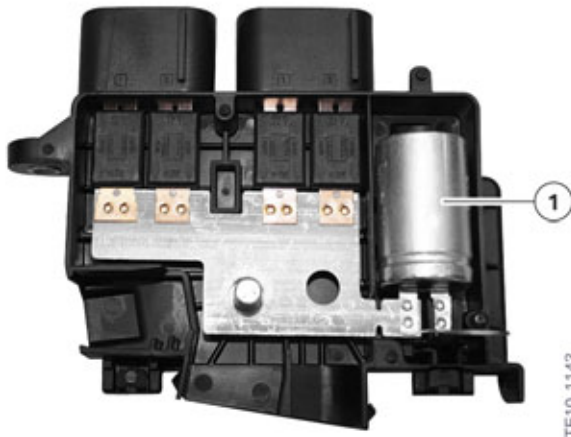
3.3.2. Influence of steering power

The power consumption of the electromechanical power steering (EPS) is extremely high. In order to avoid a brief reduction in the steering servo availability, the energy management of the F25 anticipates and responds to steering-intensive driving maneuvers (parking or three-point turns). To do this, specific input variables (e.g. vehicle speed, brake pedal operation and steering angle) are evaluated. The energy management can implement the following measures:

- Raise the idling speed and adjust the ignition timing to increase the engine torque
- Increase the vehicle voltage via the alternator
- Turn off convenience functions (heated rear window, outside mirror heating system and seat heating).

3.3.3. Power distribution box in engine compartment

A capacitor is installed in the power distribution box in the engine compartment to reduce the AC ripple in the vehicle voltage caused by the alternator.



Power distribution box in engine compartment

Index	Explanation
1	Capacitor



If a faulty electric fan fails, the harmonic content of the voltage must also be measured using a test plan in ISTA. If the harmonic content is determined to be too high, this indicates that a capacitor is also faulty and must be replaced.

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3. Voltage supply

3.4. Supply to EPS

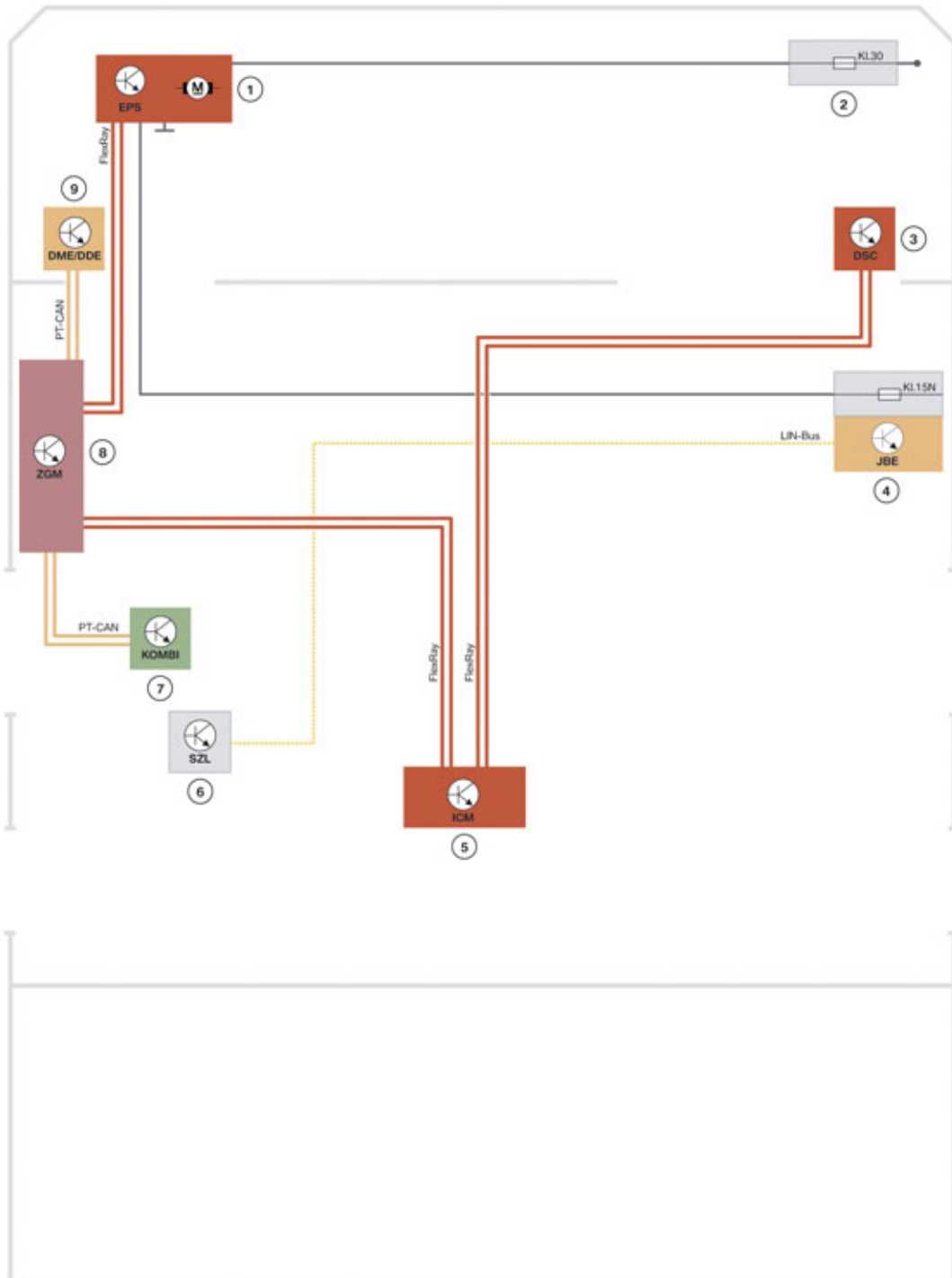
The electromechanical power steering (EPS) is installed in all F25 xDrive vehicles.

EPS can reduce fuel consumption by roughly 3% on average when compared to conventional hydraulic steering. This contributes towards a reduction in carbon dioxide emissions.

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3. Voltage supply

3.4.1. System wiring diagram



F25 System wiring diagram of electronic power steering (electromechanical power steering)

TF10-0804

F25 General Vehicle Electronics

3. Voltage supply

Index	Explanation
1	Electromechanical power steering (EPS)
2	Power distribution box in engine compartment
3	Dynamic Stability Control (DSC)
4	Junction box electronics JBE with junction box for the power distribution box
5	Integrated Chassis Management (ICM)
6	Steering column switch cluster (SZL)
7	Instrument panel (KOMBI)
8	Central gateway module (ZGM)
9	Digital Motor Electronics (DME)
Kl. 15N	Ignition (engine after-run)
Kl. 30	Terminal 30
Kl. 31	Ground connection
LIN-Bus	Local interconnect network bus

F25 General Vehicle Electronics

4. Car Access System

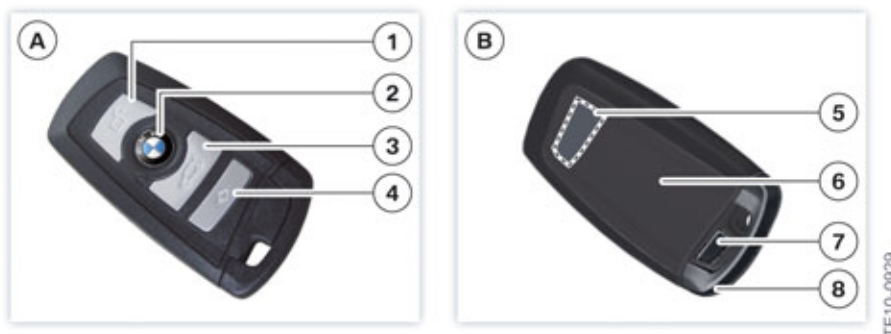
The F25 uses the fourth generation Car Access System (CAS 4). Associated with that is complete integration of the Comfort Access functions in the Car Access System.

As of series introduction, the drive authorization (Passive Go) system is fitted as standard equipment in the F25. Drive authorization allows the customer to start the engine without actively using the ID transmitter. The ID transmitter only needs to be somewhere inside the passenger compartment for the engine to be started.

An ID transmitter consists of :

- A battery
- Remote control function
- Transponder coil for emergency start function
- Spare key
- Receiver unit.

The battery has a service life of approx. four years. Up to eight ID transmitters can be used for a particular vehicle.



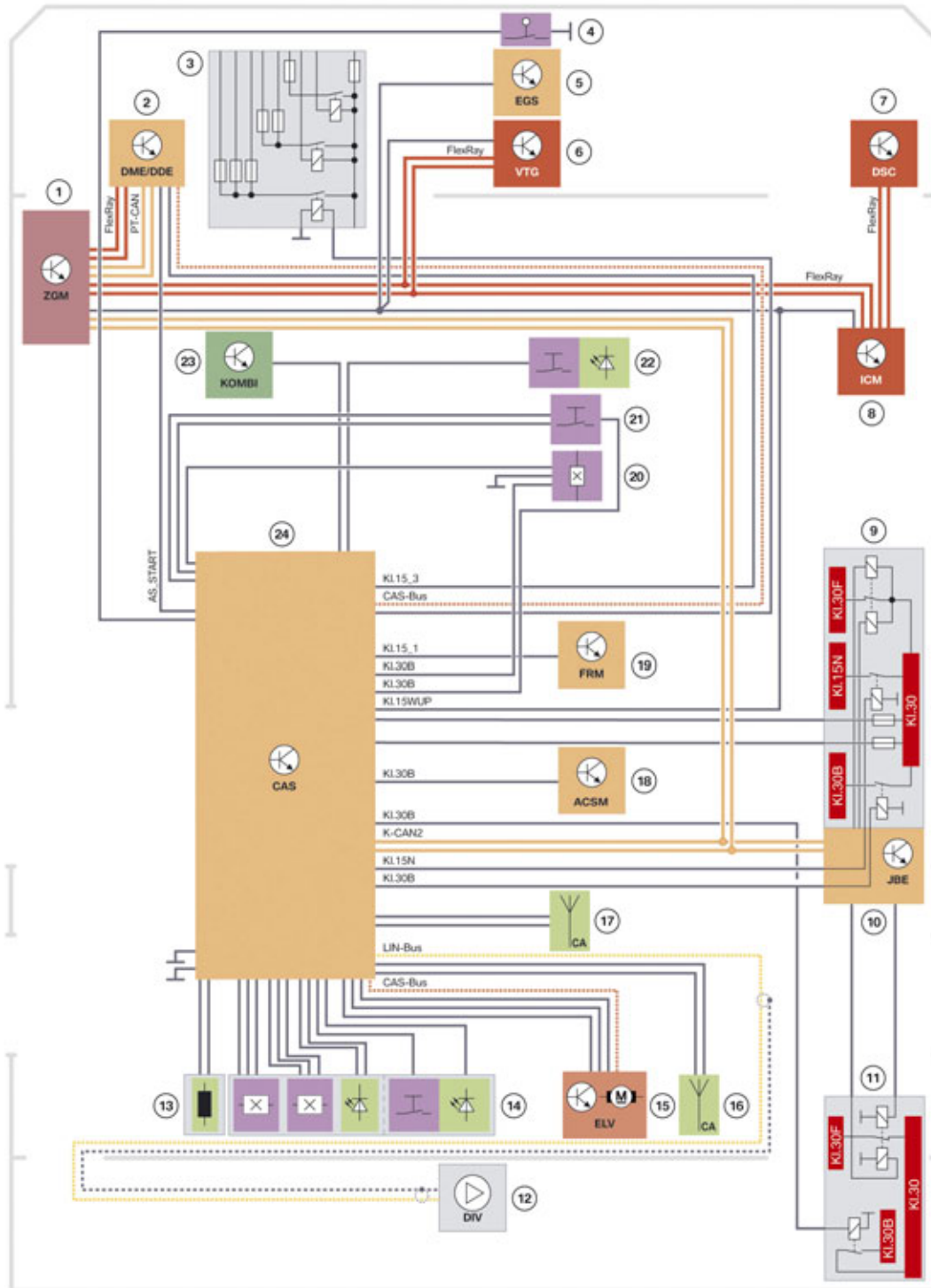
F25 ID transmitter

Index	Explanation
1	Unlock vehicle button
2	Lock vehicle button
3	Tailgate unlock button
4	Headlight courtesy delay feature (panic mode)
5	Area for ring antenna (transponder coil for emergency start)
6	Battery compartment lid
7	Integrated key release button
8	Integrated key
A	Top view of ID transmitter
B	Rear view of ID transmitter

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4. Car Access System

4.1. System wiring diagram



TE10-0912

F25 System wiring diagram of Car Access System

F25 General Vehicle Electronics

4. Car Access System

Index	Explanation
1	Central gateway module (ZGM)
2	Digital Motor Electronics (DME)
3	Power Distribution Module (PDM)
4	Engine compartment lid contact switch
5	Electronic transmission control (EGS)
6	VTG (transfer box) control unit
7	Dynamic Stability Control (DSC)
8	Integrated Chassis Management (ICM)
9	Junction box for the power distribution box
10	Junction box electronics (JBE)
11	Luggage compartment power distribution box
12	Antenna diversity with remote control receiver
13	Ring antenna (transponder coil)
14	Start/stop button
15	Electric steering lock ELV (not for US)
16	Comfort Access interior antenna
17	Comfort Access interior antenna
18	Crash Safety Module (ACSM)
19	Footwell module (FRM)
20	Clutch switch (with manual gearbox only) (not US)
21	Brake light switch
22	Button for central locking system/hazard warning switch
23	Instrument panel (KOMBI)
24	Car Access System (CAS)
AS_START	Start/start termination (DME)
CAS-Bus	Car Access System bus
Kl. 15_1	Ignition (output 1)
Kl. 15_2	Ignition (output 2)
Kl. 15_3	Ignition (output 3)
Kl. 15N	Ignition (after-run)
Kl. 15 WUP	Wake-up with terminal 15 ON
Kl. 30	Terminal 30
Kl. 30B	Terminal 30, time-dependent
LIN-Bus	Local interconnect network bus

F25 General Vehicle Electronics

4. Car Access System

4.2. Overview of functions

The Car Access System is, among other functions, the central control unit for accessing and locking the vehicle. The Car Access System has complete control over the central locking system.

The Car Access System incorporates the following functions for the F25:

- Comfort Access
- Central locking system
- Power window operation
- Panorama glass roof
- Terminal control
- Electronic immobilizer.

Other functions of the Car Access System include:

- Vehicle data storage
- Data transfer for Conditioned Based Service (CBS)
- Plausibility check of signals from ID transmitter.

Various functions are released or suppressed by the Car Access System. However, other control units are involved in actually carrying out these functions:

- Junction box electronics (JBE)
- Footwell module (FRM)
- Roof function center (FZD)

For the purposes of communication with other components of the vehicle electrical system, the Car Access System is connected to the K-CAN2, CAS bus and local interconnect network bus.

The Car Access System analyses the status of the engine compartment lid contact switch and broadcasts it for use by the alarm system.

The Car Access System also monitors the status of the following buttons and initiates the central locking function.

- Central locking system button on dashboard
- Tailgate push button on A-pillar
- Button for central locking system on inside of tailgate.

The Car Access System supplies voltage to the brake light switch and monitors its status.

An ID transmitter must be located in the passenger compartment in order for the engine to be started. The engine can now be started by pressing the start/stop button with the brake pedal pressed and the vehicle is operational.

Note: For more a complete description of the functions, please refer to the F01/F02 training information available on TIS and ICP.

F25 General Vehicle Electronics

5. Comfort Access

Using Comfort Access, the customer can unlock and open the vehicle without active use of the ID transmitter. Access to the vehicle can be gained from any point. It is sufficient if the ID transmitter is in the immediate vicinity (within a range of approx. 1.5 m) of the vehicle.

The F25 is available with Comfort Access as optional equipment (SA 322).

The benefits of Comfort Access are:

- High level of operating convenience when unlocking and locking the vehicle
- Convenient and fast access to the vehicle
- Simple engine start/shutdown procedure
- Maximum comfort for the driver.

The Comfort Access in the F25 is based on previous systems and is adapted to the F25. As is the case with current BMW models, the entire function is incorporated into the Car Access System, which means the F25 also has no separate Comfort Access control unit.

If the ID transmitter has been detected and a door handle has been touched on one of the front doors, the vehicle unlocks and can then be opened by pulling the outer door handle.

If the ID transmitter is outside the vehicle and the sensitive surface on the outer door handle of one of the front doors is touched, the vehicle locks.

Comfort Access is divided into the following functions:

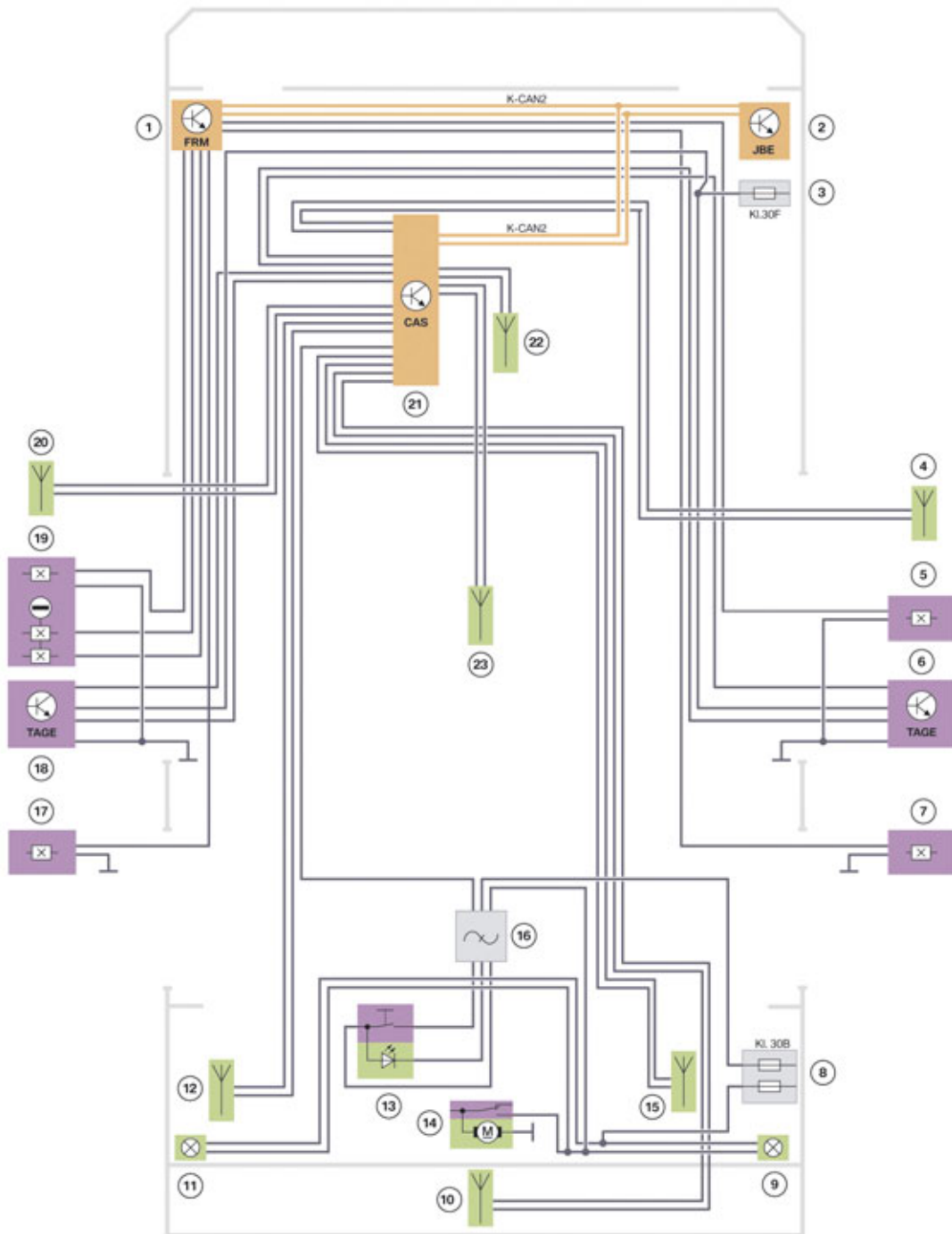
- Access authorization (Passive Entry)
- Drive authorization (Passive Go)
- Locking authorization (Passive Exit).

For more a complete description of these functions, please refer to the F01/F02 Comfort Access System training material available on TIS and ICP.

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5. Comfort Access

5.1. System wiring diagram



TE10-0913

F25 System wiring diagram of Comfort Access

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5. Comfort Access

Index	Explanation
1	Footwell module (FRM)
2	Junction box electronics (JBE)
3	Junction box for the power distribution box
4	Comfort Access antenna (door entrance on right)
5	Door contact, front passenger side, front
6	Outside door handle electronics TAGE on front passenger side, front
7	Door contact on front passenger side, rear
8	Luggage compartment power distribution box
9	Luggage compartment light on front passenger side
10	Antenna for Comfort Access (rear bumper)
11	Luggage compartment light on driver's side
12	Luggage compartment antenna, driver's side
13	Button for central locking system on inside of tailgate
14	Tailgate contact with tailgate lock
15	Luggage compartment antenna, front passenger side
16	Interference suppression filter
17	Door contact on driver's side, rear
18	Outside door handle electronics TAGE on driver's side, front
19	Door contact, hall effect sensors for driver's side lock barrel, front
20	Comfort Access antenna (entrance on left)
21	CAS Car Access System with CA Comfort Access function
22	Antenna for Comfort Access (vehicle interior, front)
23	Antenna for Comfort Access (vehicle interior, rear)
Kl. 30B	Terminal 30, time-dependent
Kl. 30F	Terminal 30, fault-dependent

F25 General Vehicle Electronics

6. Central locking system

The central locking system locks and unlocks all doors, the fuel filler flap and tailgate centrally. It is installed in the F25 as standard and can be operated via the following components:

- ID transmitter
- Driver's door lock barrel (door lock)
- Outer door handle (outside door handle electronics only with Comfort Access, SA 322)
- Button for central locking system on dashboard
- Button for central locking system on inside of tailgate (only with Comfort Access, SA 322).
- Tailgate push button on A-pillar (only with automatic tailgate activation, SA 316)
- Tailgate push button on the outside of the tailgate
- Tailgate push button on the inside of tailgate (only with automatic tailgate activation, SA 316).

The F25 has no lock in the tailgate for unlocking the vehicle using the mechanical or spare key.

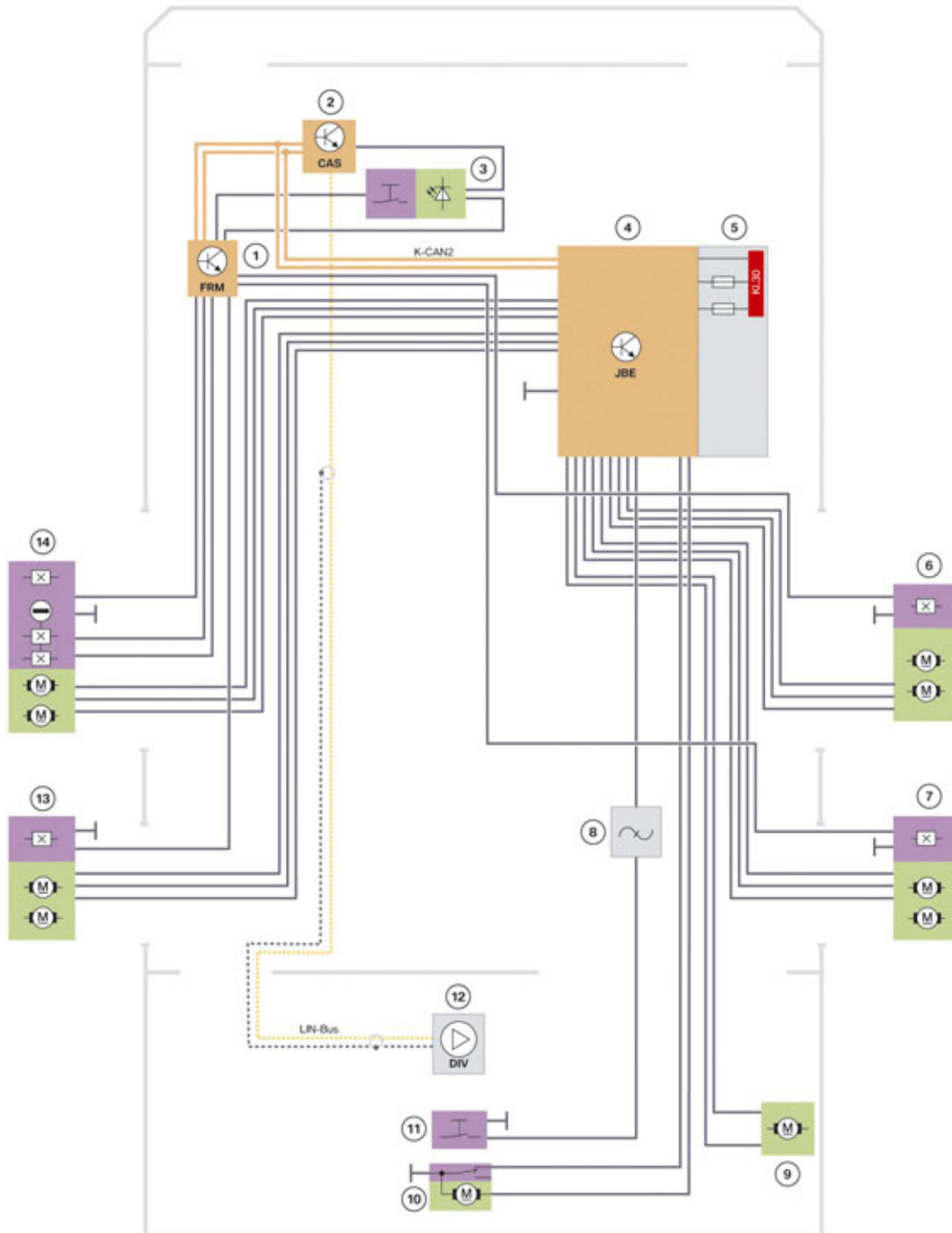
The tailgate lock can be unlocked manually from the inside of the luggage compartment. The unlocking lever is on the underside of the system lock. The system lock can be accessed by removing the lining of the luggage compartment floor.

The central locking system in the F25 is based on the familiar central locking system already used in, for instance, the E70, E90 or F01.

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6. Central locking system

6.1. System wiring diagram



F25 Central locking system wiring diagram

TE10-0914

F25 General Vehicle Electronics

6. Central locking system

Index	Explanation
1	Footwell module FRM
2	Car Access System (CAS)
3	Button for central locking system/hazard warning switch
4	Junction box electronics JBE
5	Junction box for the power distribution box
6	Door contact, central locking system on front passenger side, front
7	Door contact, central locking system on front passenger side, rear
8	Interference suppression filter
9	Central locking system, fuel filler flap
10	Tailgate contact with tailgate lock
11	Tailgate push-button on outside of the tailgate
12	Antenna diversity with antenna amplifier
13	Door contact, central locking system on driver's side, rear
14	Door contact, hall effect sensors for lock barrel, central locking system on driver's side, front
Kl. 30	Terminal 30
LIN-Bus	Local interconnect network bus

6.2. Overview of functions

The function of the central locking system is basically divided between two control units.

- The Car Access System has overall control. The Car Access System is aware of the system statuses of the central locking system. Therefore it is the Car Access System which authorizes the unlocking, locking and deadlocking of the vehicle.
- The junction box electronics executes the requests to unlock or lock the vehicle.

It is possible to unlock and lock the vehicle actively or passively.

Active means that the vehicle can be opened after it has been unlocked by a press of the button on the ID transmitter. The vehicle can be locked by pressing the Lock button after the doors have been closed.



Note: The vehicle can only be locked with the driver's door closed.

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6. Central locking system

Passive locking and unlocking requires the optional equipment Comfort Access (SA 322).

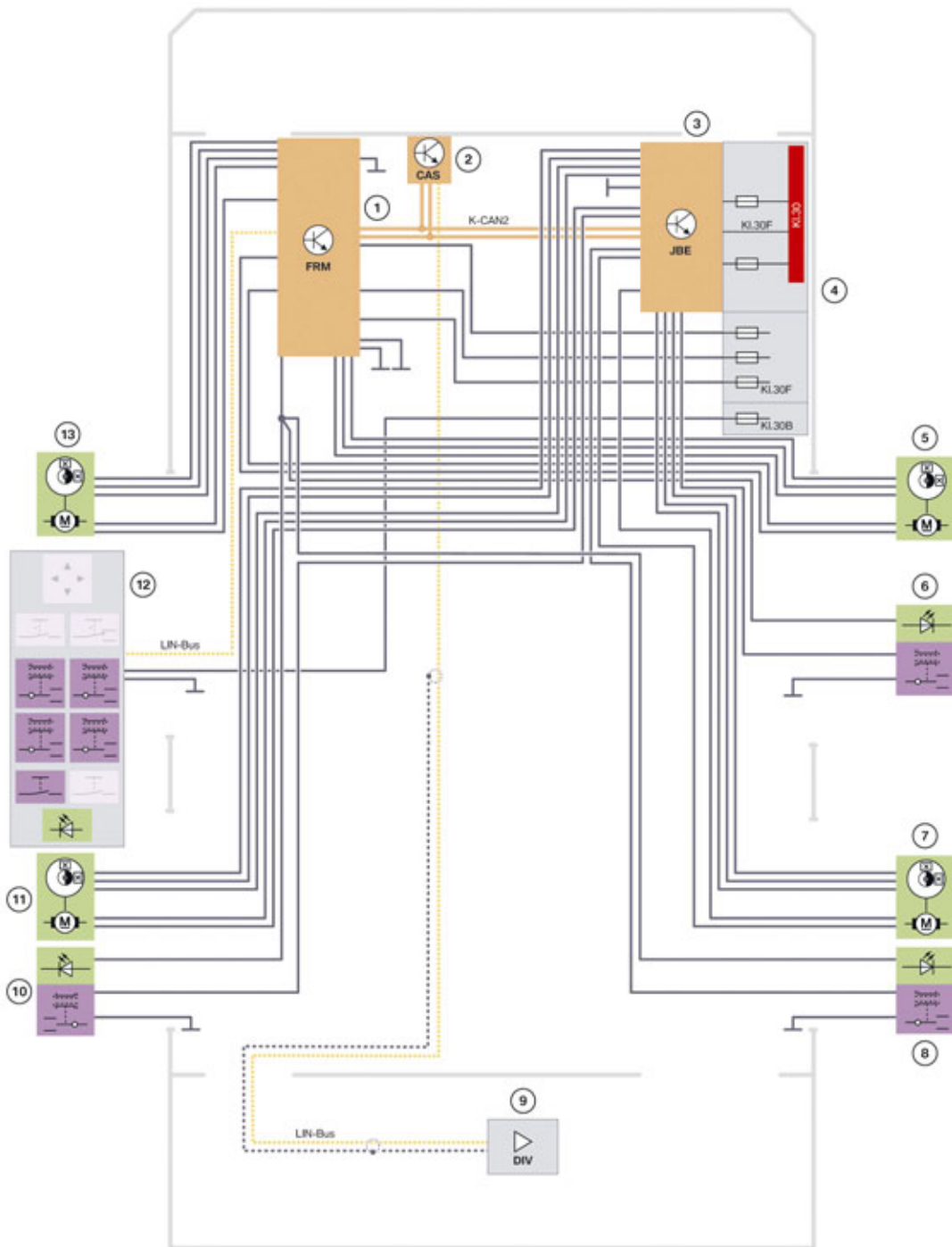
Passive means the vehicle is unlocked when the outer door handle is grasped, provided the ID transmitter is no more than approx. 1.5 metres from the vehicle. The locking operation is activated by touching the sensitive surface on the outer door handle.

For more information regarding the functions, please refer to the Car Access System F01/F02 training material available on TIS and ICP.

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7. Power window regulators

7.1. System wiring diagram



TE10-0915

F25 Power window regulator system wiring diagram

F25 General Vehicle Electronics

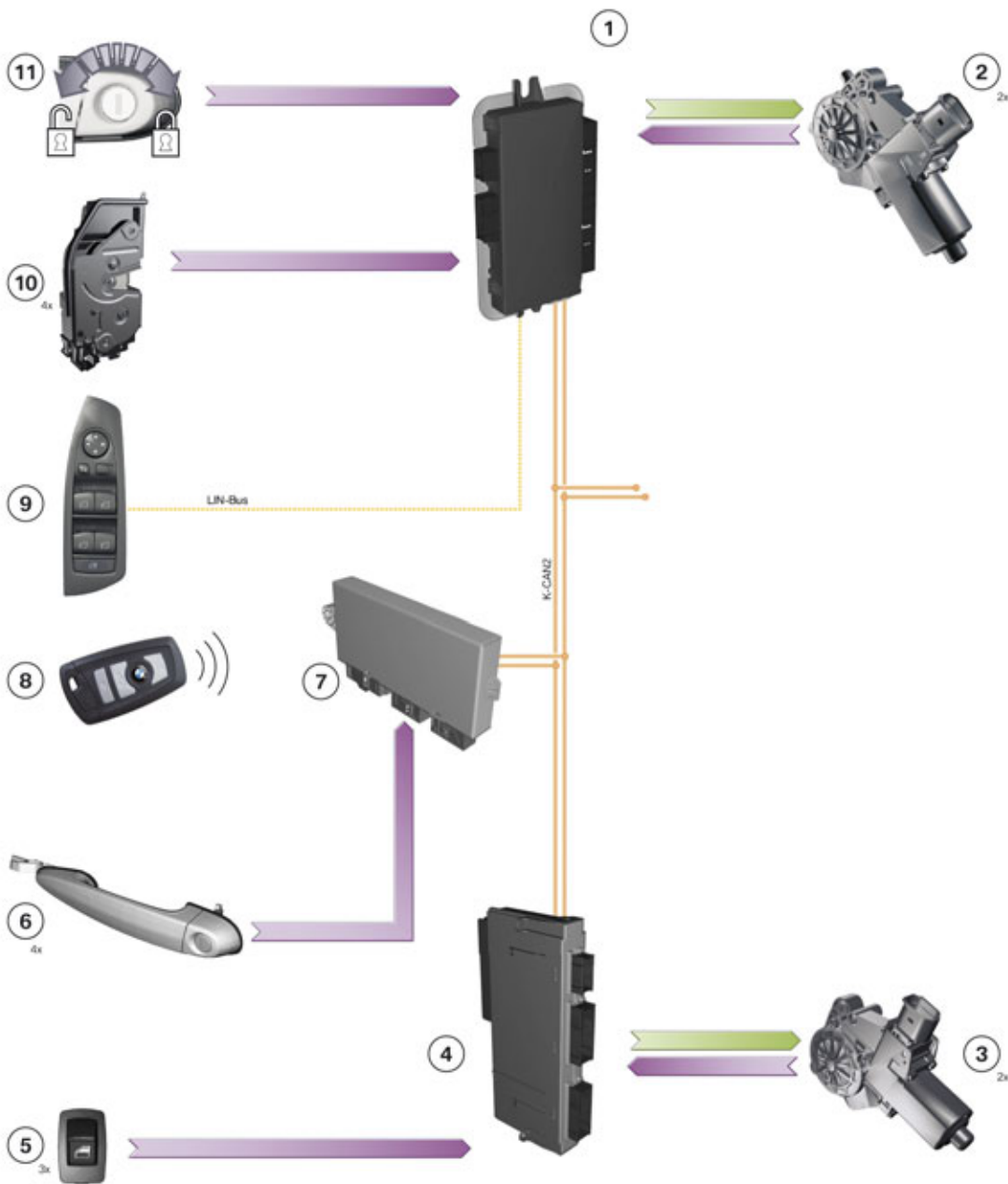
7. Power window regulators

Index	Explanation
1	Footwell module FRM
2	Car Access System (CAS)
3	Junction box electronics (JBE)
4	Junction box for the power distribution box
5	Power window motor with indirect anti-trap mechanism on front passenger side at front
6	Power window switch, front passenger side, front
7	Power window motor with indirect anti-trap mechanism on front passenger side at rear
8	Power window switch, front passenger side rear
9	Antenna diversity with antenna amplifier
10	Power window switch, driver's side rear
11	Power window motor with indirect anti-trap mechanism on the rear driver's side
12	Switch block, driver's door
13	Power window regulators with indirect anti-trap mechanism on driver's side at front
Kl. 30	Terminal 30
Kl. 30B	Terminal 30, time-dependent
Kl. 30F	Terminal 30, fault-dependent
LIN-Bus	Local interconnect network bus

F25 General Vehicle Electronics

7. Power window regulators

7.2. Input/output



F25 Input/output, power window regulators

TE10-0928

F25 General Vehicle Electronics

7. Power window regulators

Index	Explanation
1	Footwell module (FRM)
2	Power window motor, front doors
3	Power window motor, rear doors
4	Junction box electronics (JBE)
5	Power window switch, driver's side rear/front passenger side front and rear
6	Outer door handle for Comfort Access (CA)
7	Car Access System (CAS)
8	ID transmitter
9	Switch block, driver's door
10	Door lock with door contact
11	Driver's door lock barrel
K-CAN2	Body controller area network 2
LIN-Bus	Local interconnect network bus

7.3. Examples of the signal path

The following examples show the signal paths prior to opening or closing of the side windows by the power window motors. As a prerequisite, operation of the power windows must have been enabled by the Car Access System.

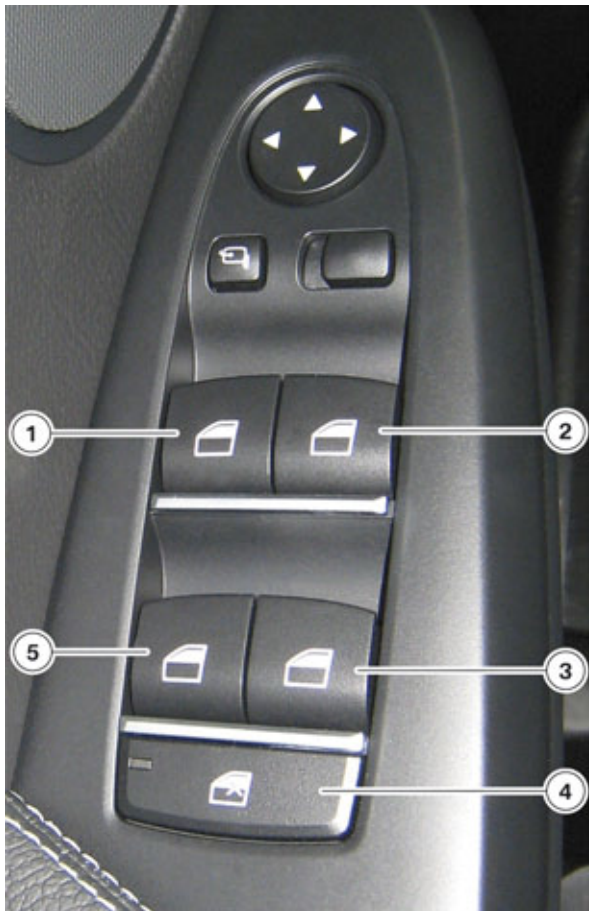
7.3.1. Switch block, driver's door

If the front left or front right power window switch is pressed, the signal is routed to the footwell module via the local interconnect network bus. The footwell module drives the corresponding power window motor.

If the rear left or rear right power window switch is pressed, the signal from the switch block in the driver's door is routed to the footwell module via the local interconnect network bus. The footwell module sends the signal via the body controller area network 2 to the junction box electronics. The junction box electronics controls the relevant power window motor.

F25 General Vehicle Electronics

7. Power window regulators



F25 Switch block, driver's door

Index	Explanation
1	Power window switch, front left
2	Power window switch, front right
3	Power window switch, rear right
4	Safety switch
5	Power window switch, rear left

7.3.2. Power window switch, front passenger door

The signal is routed to the junction box electronics when the power window switch in the front passenger door is operated. The junction box electronics sends the signal to the footwell module via the body controller area network 2. The footwell module drives the power window motor.

7.3.3. Power window switch, rear doors

If a power window switch in one of the rear doors is operated, the signal is routed to the junction box electronics. The junction box electronics controls the power window motor.

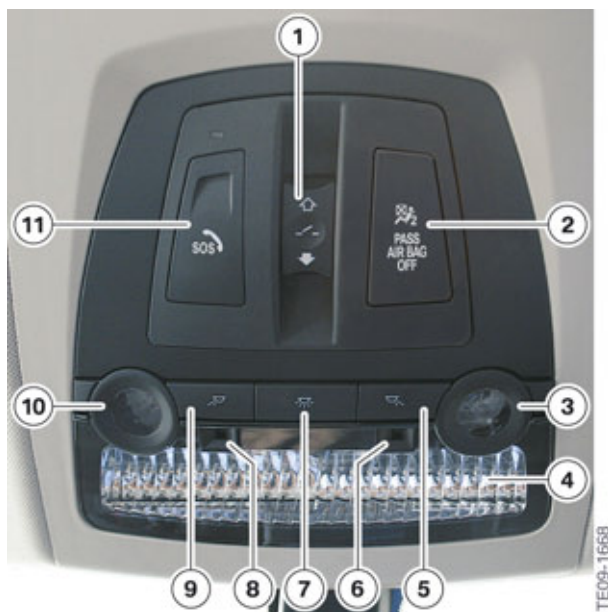
F25 General Vehicle Electronics

8. Panorama sunroof

The panorama glass roof is available as optional equipment (SA 402) for the F25. This function involves several control units:

- The footwell module FRM supplies the signals from the door contacts.
- The Car Access System CAS enables or blocks operation of the panorama sunroof
- The roof function center FZD controls and monitors the electric motors of the panorama sunroof and also supplies the necessary voltage via terminal 30.

For more information regarding the sunroof functions, please refer to the F01/F02 Sliding Tilting Sunroof training material available on TIS and ICP.



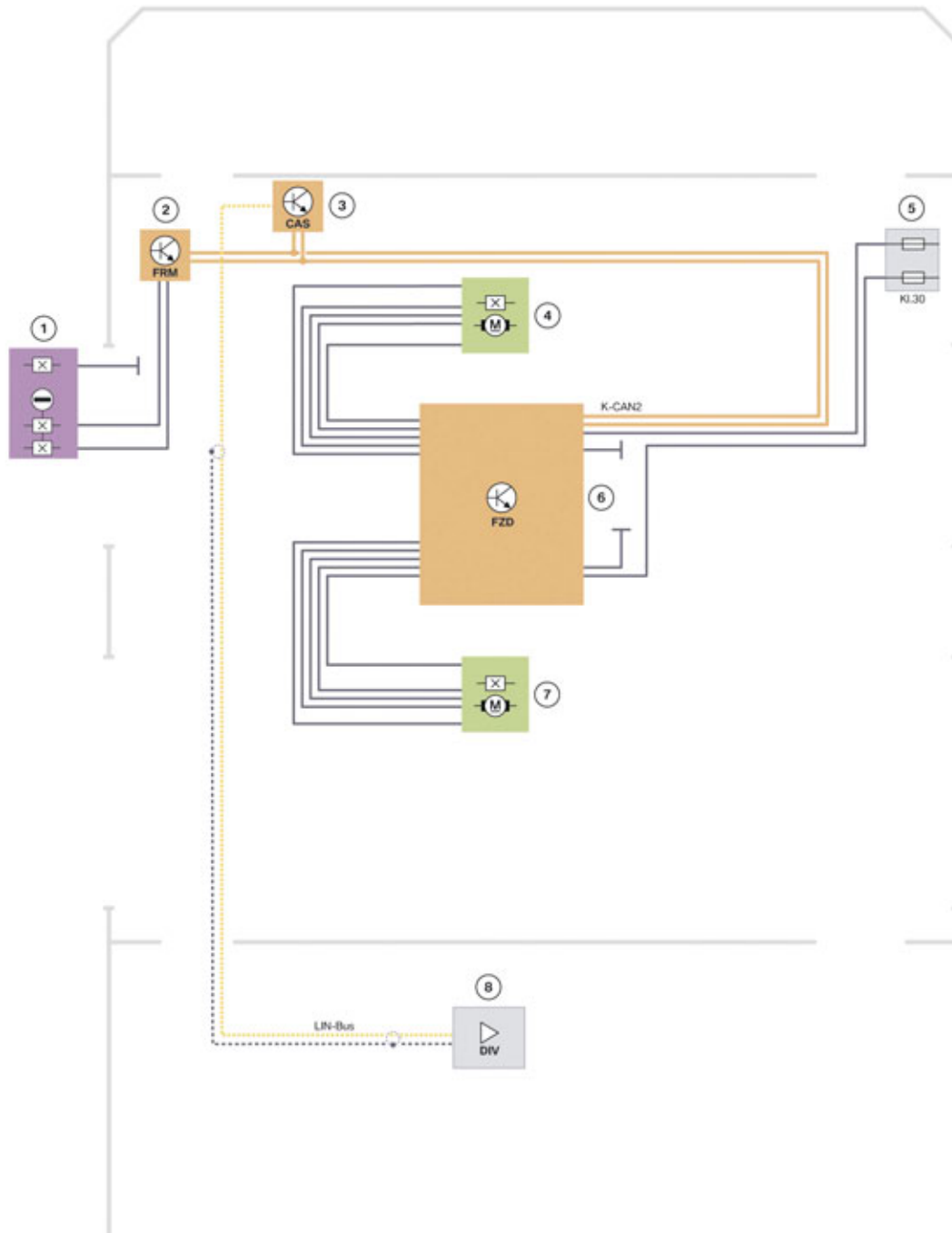
F25 Roof function center

Index	Explanation
1	Switch for panorama sunroof
2	Indicator lamp for front passenger airbag deactivation
3	Reading light, right
4	Interior light
5	Button for reading light on right
6	Ambient lighting
7	Button for interior light
8	Ambient lighting
9	Button for reading light on left
10	Reading light on left
11	Emergency call button (only with SA 6NL)

F25 General Vehicle Electronics

8. Panorama sunroof

8.1. System wiring diagram



TE10-0916

F25 System wiring diagram of panorama glass roof

F25 General Vehicle Electronics

8. Panorama sunroof

Index	Explanation
1	Door contact, hall effect sensors for lock barrel on driver's side, front
2	Footwell module (FRM)
3	Car Access System (CAS)
4	Electric motor, panorama glass roof
5	Junction box for the power distribution box
6	Roof function center FZD with button for panorama sunroof
7	Electric motor for sliding trim
8	Antenna diversity with antenna amplifier
Kl. 30	Terminal 30
LIN-Bus	Local interconnect network bus

F25 General Vehicle Electronics

9. Alarm system

The alarm system DWA is to indicate when the vehicle is accessed without authorization by emitting an alarm. The alarm can be triggered both audibly and visually. To do this, the alarm system must be activated. When activated, the alarm system monitors the whole of the vehicle interior.

In addition the alarm system monitors the engine compartment it also monitors all 4 doors and tailgate.

The alarm system also signals when an attempt is made to tamper with the vehicle, e.g. by cutting through the feed line to the siren with tilt alarm sensor SINE.

The alarm system's ultrasonic interior movement detector is integrated into the roof function center FZD. The ultrasound waves pass into the inside of vehicle through openings in the grille of the roof function center.

The siren with tilt alarm sensor SINE is located in the area of the front wheel arch.

For more information on the operating principle of the alarm system, refer to the F01/F02 Anti-theft System training manual available on TIS and ICP.

F25 General Vehicle Electronics

9. Alarm system

Index	Explanation
1	Engine compartment lid contact switch
2	Siren with tilt alarm sensor (SINE)
3	Junction box electronics (JBE)
4	Junction box for the power distribution box
5	Door contact, front passenger side, front
6	Door contact on front passenger side, rear
7	Tailgate contact with tailgate lock
8	Door contact on driver's side, rear
9	Door contact, driver's side, front
10	Footwell module (FRM)
11	Car Access System (CAS)
12	Light-emitting diode (DWA)
13	Roof function center FZD with control unit for ultrasonic interior movement detector USIS
Kl. 30	Terminal 30
LIN-Bus	Local interconnect network bus

The status of the following components is monitored:

- the door contacts, by the footwell module (FRM)
- the engine compartment lid contact switch, by the Car Access System (CAS)
- the tailgate contact, by the junction box electronics (JBE).

As soon as a status changes, the control unit for the ultrasonic interior movement detector USIS receives a corresponding signal via the body controller area network 2. If the anti-theft alarm system is activated, an alarm is triggered.

F25 General Vehicle Electronics

10. Automatic operation of tailgate

The automatic operation of tailgate is available for the F25 from series introduction. It can be ordered as optional equipment SA 316 Automatic tailgate activation.

The automatic operation of tailgate allows the vehicle to be accessed more conveniently by opening or closing the tailgate automatically at the push of a button. A spindle-driven system features for the first time in the F25 for automatic opening or closing of the tailgate.

The automatic operation of tailgate is implemented via the following components:

- Tailgate push-button on the outside of the tailgate
- ID transmitter
- Tailgate push-button on A-pillar
- Tailgate push-button on the inside of the tailgate
- Button for central locking system on inside of tailgate (only with Comfort Access, SA 322).



Index	Explanation
1	Tailgate push-button on the inside of the tailgate
2	Button for central locking system on inside of tailgate ¹

¹ Only with Comfort Access (SA 322).

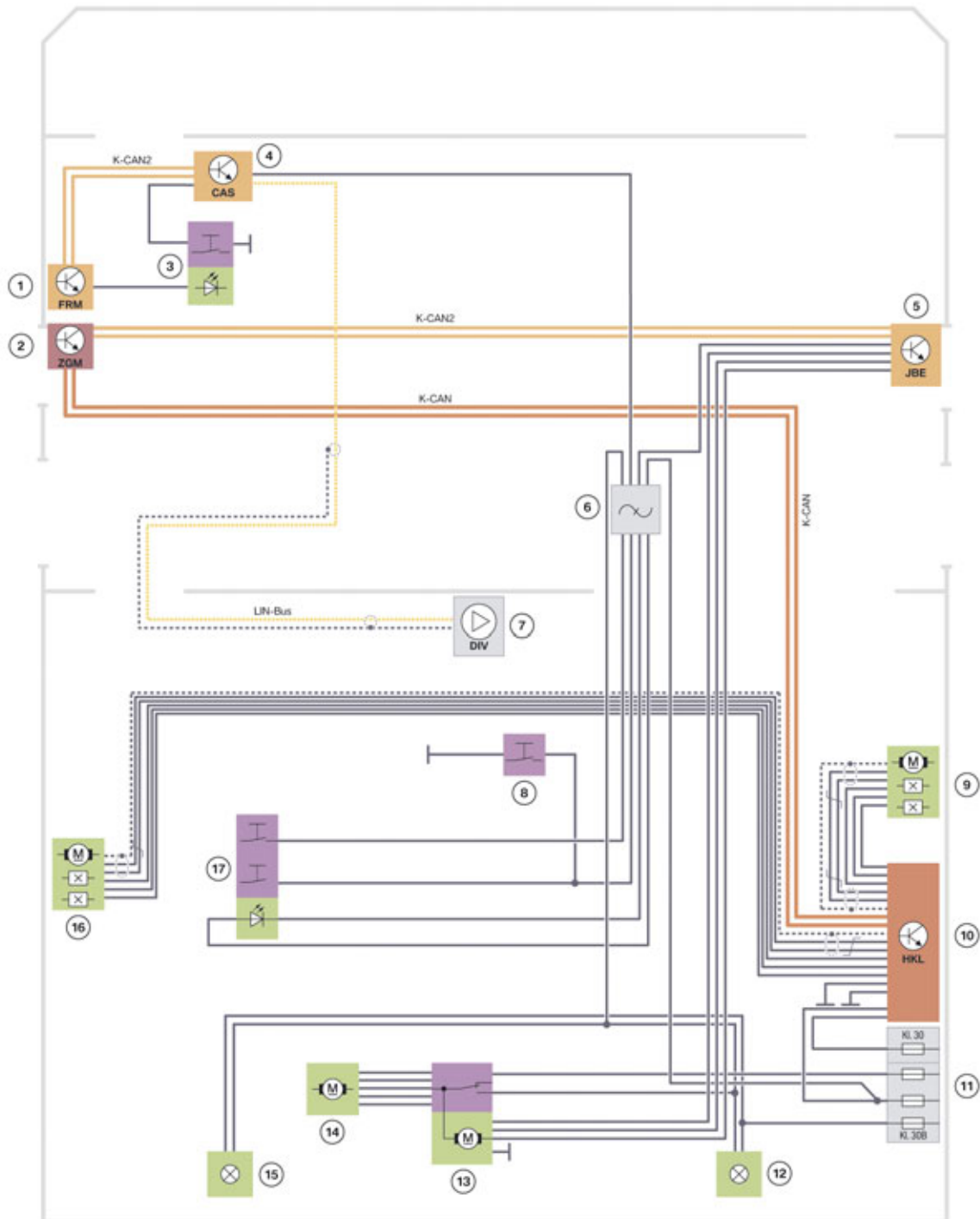
If the optional equipment Comfort Access (SA 322) is also fitted in the vehicle, the tailgate can also be opened automatically even when the vehicle is locked. To open the vehicle via the tailgate push-button on the outside of the tailgate, a suitable ID transmitter must be close to the rear end of the vehicle.

It is now also possible in conjunction with the Comfort Access (SA 322) to lock the car doors via the button for the central locking system on the inside of the tailgate.

F25 General Vehicle Electronics

10. Automatic operation of tailgate

10.1. System wiring diagram



TE10-0918

F25 Tailgate activation system wiring diagram

F25 General Vehicle Electronics

10. Automatic operation of tailgate

Index	Explanation
1	Footwell module (FRM)
2	Central gateway module (ZGM)
3	Tailgate push-button on A-pillar
4	Car Access System (CAS)
5	Junction box electronics (JBE)
6	Interference suppression filter
7	Antenna diversity with antenna amplifier
8	Tailgate push-button on the outside of the tailgate
9	Spindle drive on front passenger side
10	Control unit for automatic operation of tailgate (HKL)
11	Luggage compartment power distribution box
12	Luggage compartment light on front passenger side
13	Tailgate contact and tailgate lock
14	Automatic Soft Close system, tailgate
15	Luggage compartment light on driver's side
16	Spindle drive on driver's side
17	Tailgate push-button and button for central locking system on inside of tailgate ¹
Kl. 30	Terminal 30
Kl. 30B	Terminal 30, time-dependent
LIN-Bus	Local interconnect network bus

¹ Button for central locking system on inside of tailgate only available with Comfort Access (SA 322).

The radio signal from the ID transmitter is received by the rear window antenna. The remote control receiver in the antenna diversity module forwards the signal to the Car Access System via the local interconnect network bus. The Car Access System is the master control unit for the central locking function.

Once the signal has been successfully verified, the Car Access System issues a command to activate the central locking system in the tailgate.

The junction box electronics execute the command to activate the central locking system in the tailgate. The status of the tailgate contact for the automatic operation of tailgate function is acquired by the junction box electronics and sent to the control unit for the automatic operation of tailgate via the body controller area network. The status is one of the triggering criteria for luggage compartment lid operation.

The control unit for the automatic tailgate operation monitors the movement of the tailgate via sensors in the spindle drives. It also records the power consumption of the spindle drives.

F25 General Vehicle Electronics

10. Automatic operation of tailgate

If the luggage compartment lid is blocked when closing, it is moved back slightly (reversed) by the automatic operation of tailgate in order to release the blockage. An obstruction to the tailgate movement during opening causes the tailgate to stop and it is not reversed.

F25 General Vehicle Electronics

11. Exterior lights

The exterior lights of the F25 are based on current BMW models.

The F25 xDrive28i includes halogen headlights as standard equipment.

Bi-xenon headlights (SA 522) are available as option with the ZCV Convenience Package (SA 522 will also add 524 Adaptive light control).

Bi-xenon headlights (SA 522) with Adaptive light control (SA 524) are standard on the F25 xDrive35i.

With the Bi-xenon headlight, light-emitting diodes are used for the daytime running lights and side lights.



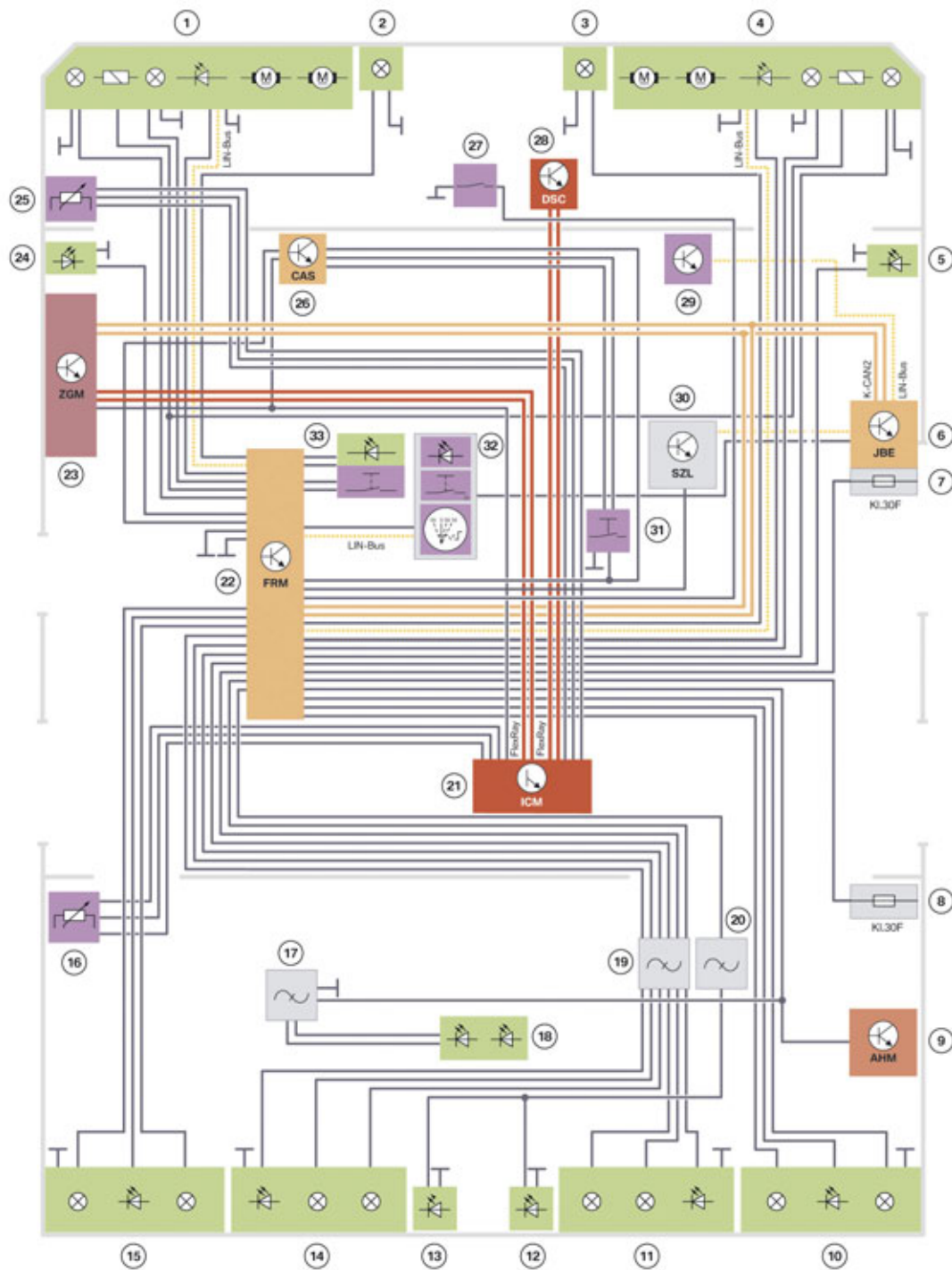
Although they are optional equipment on the F25 xDrive28i and standard on the xDrive 35i, Bi-xenon headlights (SA 522) are available only in conjunction with Adaptive Headlights (SA 524).

For more information regarding exterior lights, refer to the F01/F02 Exterior Lighting training material available on TIS and ICP.

F25 General Vehicle Electronics

11. Exterior lights

11.1. System wiring diagram



TE10-0920

F25 System wiring diagram of exterior lights (with bi-xenon headlights, SA 522)

F25 General Vehicle Electronics

11. Exterior lights

Index	Explanation
1	Headlight, left (second stepper motor only required with Adaptive Headlights, SA 524)
2	Front fog light, left (including cornering light with Adaptive Headlights, SA 524)
3	Front fog light, right (including cornering light with Adaptive Headlights, SA 524)
4	Headlight, left (second stepper motor only required with Adaptive Headlights, SA 524)
5	Side repeater, right
6	Junction box electronics
7	Junction box for the power distribution box
8	Luggage compartment power distribution box
9	Trailer module AHM (not for US)
10	Outer rear light, right
11	Inner rear light, right (in tailgate)
12	Number plate light, right (in tailgate)
13	Number plate light, left (in tailgate)
14	Inner rear light, left (in tailgate)
15	Outer rear light, left
16	Ride height sensor, rear
17	Interference suppression filter
18	Additional brake light
19	Interference suppression filter
20	Interference suppression filter
21	Integrated Chassis Management (ICM)
22	Footwell module (FRM)
23	Central gateway module (ZGM)
24	Side repeater, left
25	Ride height sensor, front
26	Car Access System (CAS)
27	Reverse light switch (only with manual gearbox) (not US)
28	Dynamic Stability Control (DSC)
29	Rain-light-solar-condensation sensor
30	Steering column switch cluster SZL
31	Brake light switch

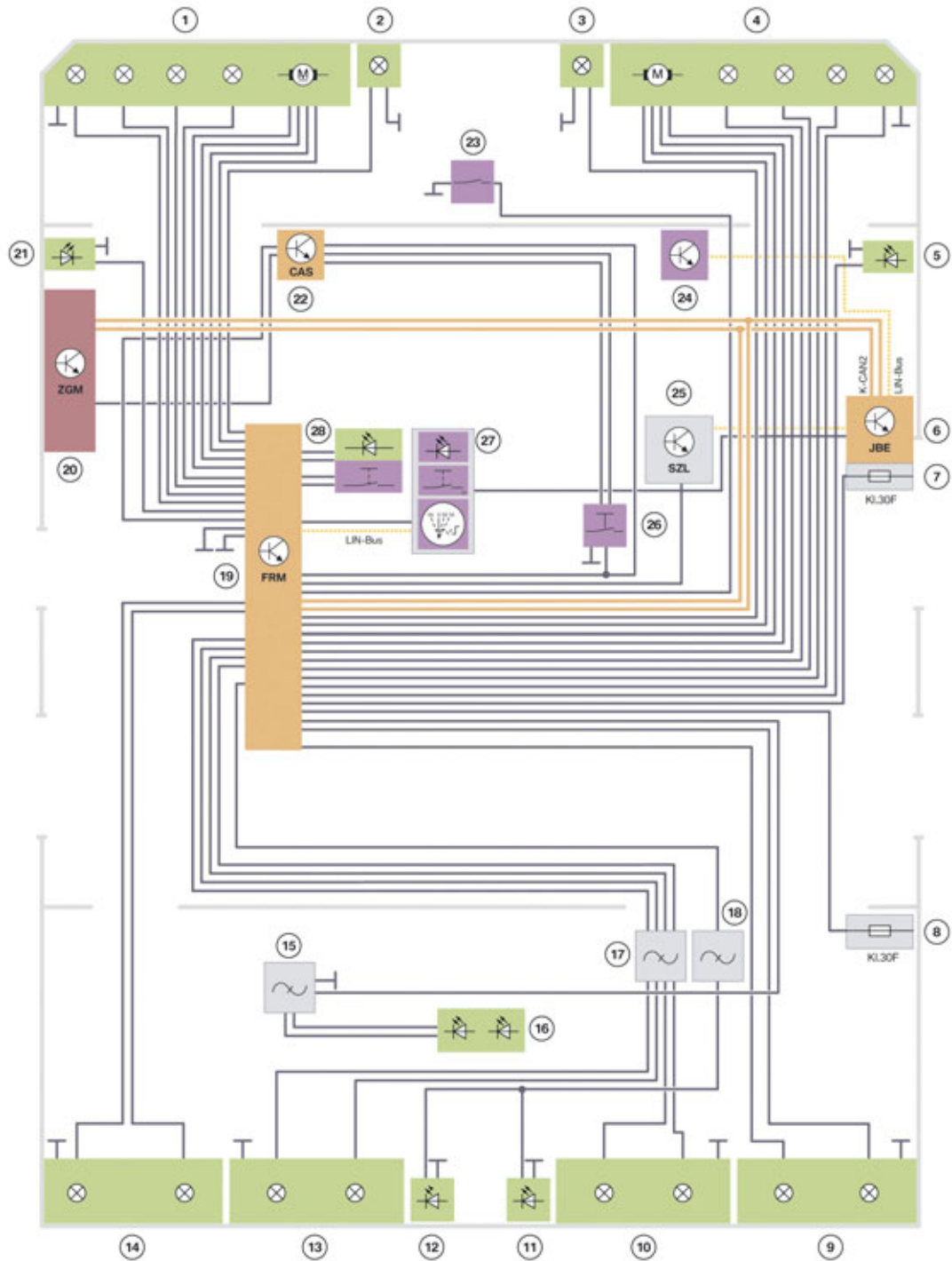
F25 General Vehicle Electronics

11. Exterior lights

Index	Explanation
32	Operating facility, light switch
33	Central locking button/hazard warning switch
Kl. 30F	Terminal 30, fault-dependent
LIN-Bus	Local interconnect network bus

F25 General Vehicle Electronics

11. Exterior lights



F25 System wiring diagram of exterior lights (with halogen headlights)

TE10-1141

F25 General Vehicle Electronics

11. Exterior lights

Index	Explanation
1	Headlight, left
2	Front fog light, left
3	Front fog light, right
4	Headlight, right
5	Side repeater, right
6	Junction box electronics
7	Junction box for the power distribution box
8	Luggage compartment power distribution box
9	Outer rear light, right
10	Inner rear light, right (in tailgate)
11	Number plate light, right (in tailgate)
12	Number plate light, left (in tailgate)
13	Inner rear light, left (in tailgate)
14	Outer rear light, left
15	Interference suppression filter
16	Additional brake light
17	Interference suppression filter
18	Interference suppression filter
19	Footwell module (FRM)
20	Central gateway module (ZGM)
21	Side repeater, left
22	Car Access System (CAS)
23	Reverse light switch (only with manual gearbox)
24	Rain-light-solar-condensation sensor
25	Steering column switch cluster (SZL)
26	Brake light switch
27	Operating facility, light switch
28	Central locking button/hazard warning switch
KI. 30F	Terminal 30, fault-dependent
LIN-Bus	Local interconnect network bus

F25 General Vehicle Electronics

11. Exterior lights

11.2. Lighting, front

The following graphic shows the layout of the front headlight.



F25 Xenon headlight, front

Index	Explanation
1	Xenon light for low and high-beam headlight
2	Turn indicator
3	Fog lights (including cornering light with Adaptive Headlights, SA 524)
4	Corona ring with light-emitting diode for side lights/daytime driving lights
5	Corona ring with light-emitting diode for daytime driving lights

F25 General Vehicle Electronics

11. Exterior lights



F25 Halogen headlight, front

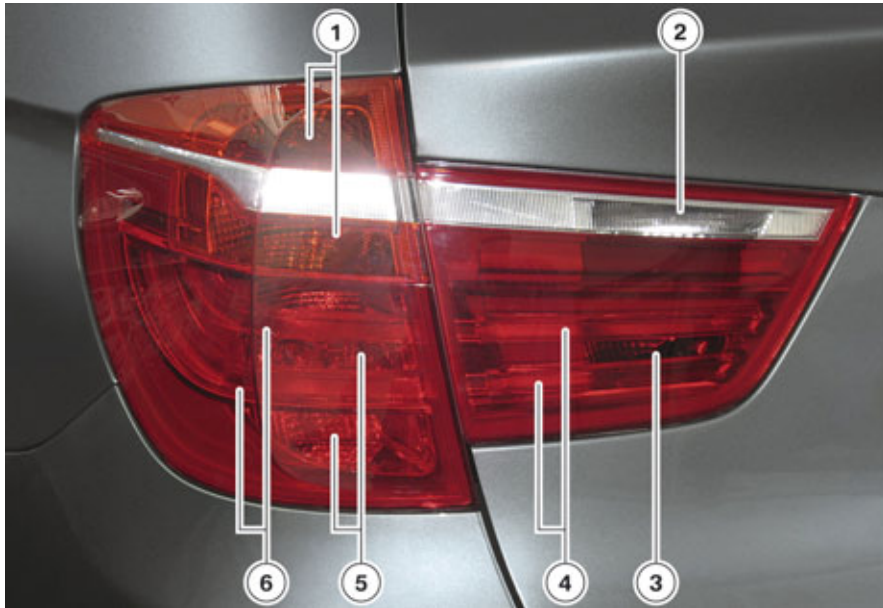
Index	Explanation
1	Low-beam headlight
2	Side lights
3	High-beam headlight
4	Front fog light
5	Turn indicator

F25 General Vehicle Electronics

11. Exterior lights

11.3. Lighting, rear

The F25 is equipped with a two-part rear light cluster. The layout of the rear lights is shown in the following graphic.



F25 Rear light

Index	Explanation
1	Turn indicator
2	Reverse light
3	Brake light for two-stage stop light (Not for US)
4	Tail light/brake light (light-emitting diode tubes) ³
5	Tail light/brake light ⁴ ; Brake light ³
6	Tail light/brake light (light-emitting diode tubes) ³

³ Only with bi-xenon headlight (SA 522).

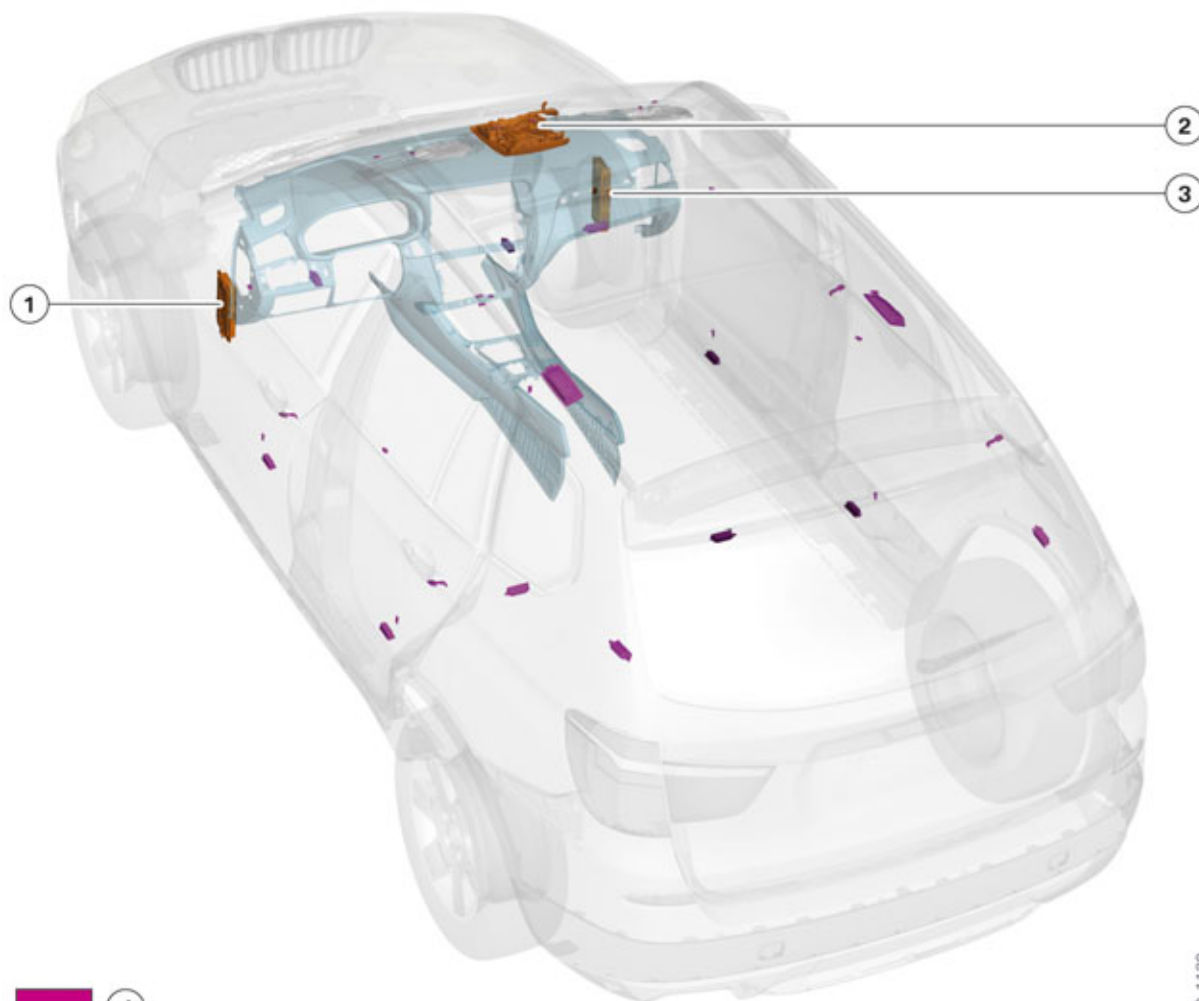
⁴ Only with halogen headlights

F25 General Vehicle Electronics

12. Interior lights

The interior lighting of the F25 is controlled via the footwell module FRM control unit.

The footwell module is the central control unit for the interior lighting system. All interior lighting outputs of the footwell module are pulse-modulated. This ensures that the brightness of the interior lighting remains constant in the event of voltage fluctuations. The pulse width modulation is additionally used for the soft ON/soft OFF function.



TK10-1139

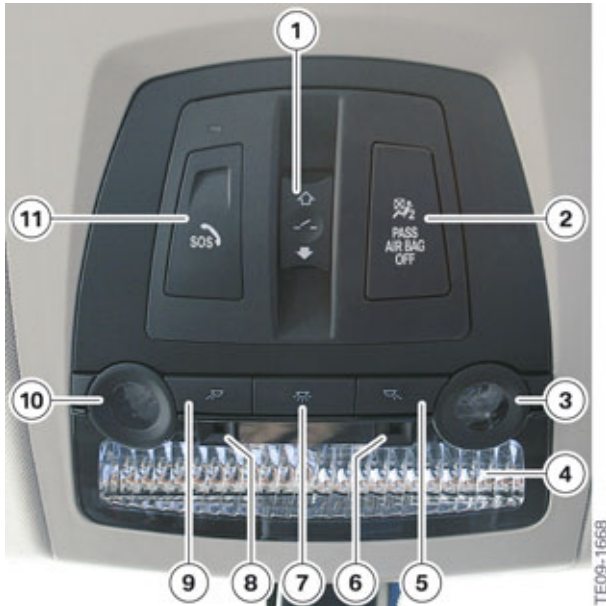
 4
F25 Interior lighting

Index	Explanation
1	Footwell module (FRM)
2	Roof function center FZD with interior light unit and reading lights
3	Junction box electronics (JBE)
4	Interior lighting

F25 General Vehicle Electronics

12. Interior lights

The components for the interior lighting in the front roof area are integrated in the roof function center (FZD) and in the sun visors. The footwell lighting is located on the underside of the dashboard. Voltage is supplied to the rear reading and passenger-compartment lights via the roof function center.



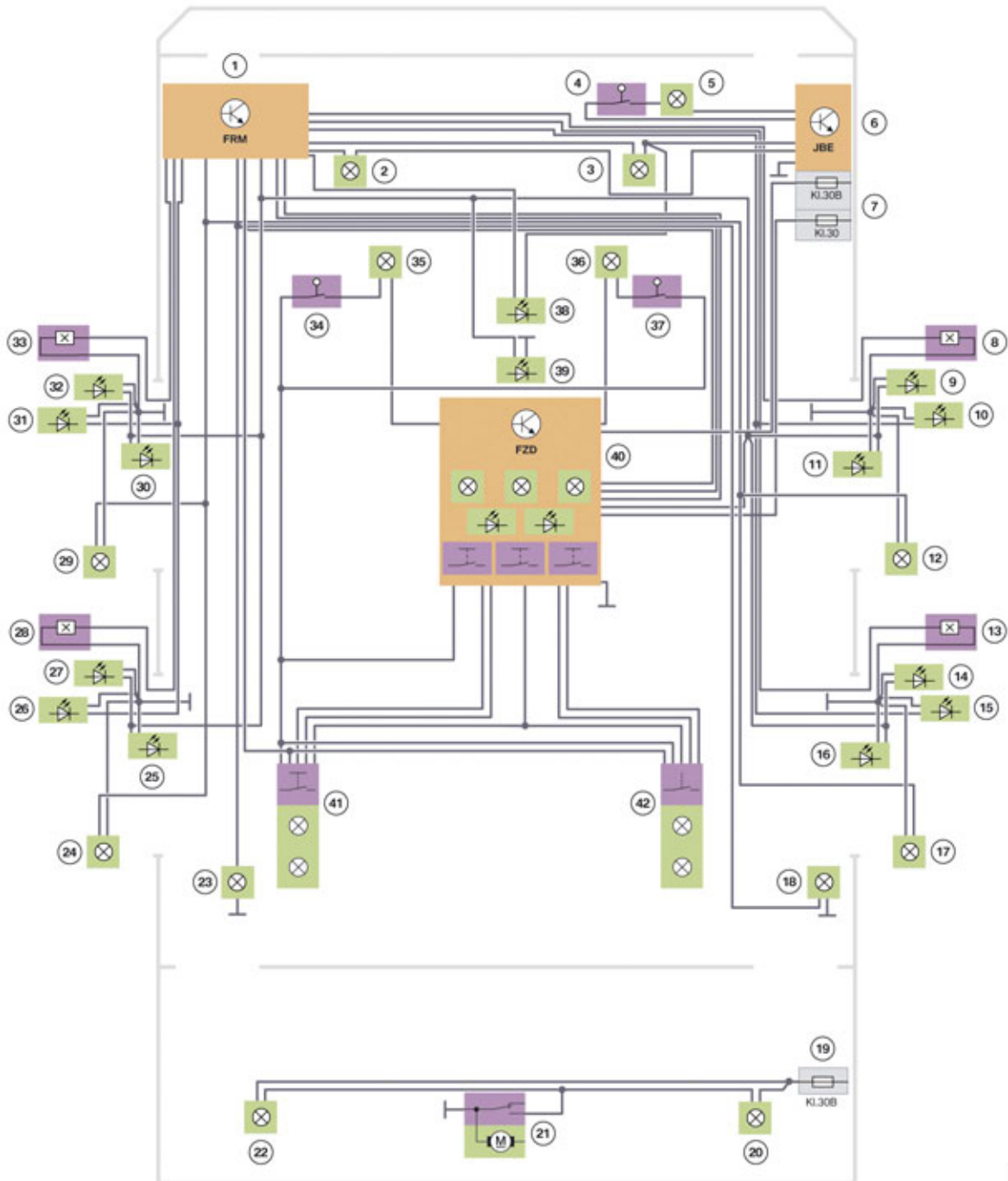
F25 Roof function center

Index	Explanation
1	Switch for panorama glass roof
2	Indicator lamp for front passenger airbag deactivation
3	Reading light, right
4	Interior light
5	Button for reading light on right
6	Ambient lighting
7	Button for interior light
8	Ambient lighting
9	Button for reading light on left
10	Reading light on left
11	Emergency call button (only with SA 6NL)

F25 General Vehicle Electronics

12. Interior lights

12.1. System wiring diagram



TE10-0919

F25 System wiring diagram, interior lighting

F25 General Vehicle Electronics

12. Interior lights

Index	Explanation
1	Footwell module (FRM)
2	Footwell light on driver's side, front
3	Footwell light on front passenger side, front
4	Glove box switch
5	Glove box light
6	Junction box electronics (JBE)
7	Junction box for the power distribution box
8	Door contact, front passenger side, front
9	Inside door handle light on front passenger side, front ¹
10	Ground lights on front passenger side, front ²
11	Door pocket lighting on front passenger side, front ¹
12	Entrance lighting on front passenger side, front ¹
13	Door contact on front passenger side, rear
14	Inside door handle light on front passenger side, rear ¹
15	Ground lights on front passenger side, rear ²
16	Door pocket lighting on front passenger side, rear ¹
17	Entrance lighting on front passenger side, rear ¹
18	Footwell light on front passenger side, rear ¹
19	Luggage compartment power distribution box
20	Luggage compartment light on front passenger side
21	Tailgate contact with tailgate lock
22	Luggage compartment light on driver's side
23	Footwell light on driver's side, rear ¹
24	Entrance lighting on driver's side, rear ¹
25	Door pocket lighting on driver's side, rear ¹
26	Ground lights on driver's side, rear ²
27	Inside door handle light on driver's side, rear ¹
28	Door contact on driver's side, rear
29	Entrance lighting on driver's side, front ²
30	Door pocket lighting on driver's side, front ²
31	Ground lights on driver's side, front ²

F25 General Vehicle Electronics

12. Interior lights

Index	Explanation
32	Inside door handle light on driver's side, front ¹
33	Door contact, driver's side, front
34	Vanity mirror light switch on driver's side
35	Vanity mirror light on driver's side
36	Vanity mirror light on passenger side
37	Vanity mirror light switch, front passenger side
38	Center console storage compartment lighting, front ¹
39	Center console storage compartment lighting, front ¹
40	Roof function center FZD with interior light unit and reading lights
41	Interior light/reading light on driver's side, rear
42	Interior light/reading light on front passenger side, rear
Kl. 30	Terminal 30
Kl. 30B	Terminal 30, time-dependent

¹ Only with interior light package (SA 563) in ZPP Premium Package.

² Only with interior light package (SA 563) or Comfort Access (SA 322).

12.2. Examples of switching operations

If a door is opened when the vehicle is unlocked, the status of the relevant door contact changes. The footwell module FRM evaluates the status and sends the request to switch on the interior light. The footwell module FRM switches on the door entry lighting for the open door and the footwell lighting.

The status of the door contact changes again when the door is closed. The footwell module initiates the procedure to switch off the interior light.

The luggage compartment lights are connected to the voltage supply via terminal 30B. If the tailgate is opened, the luggage compartment lights switch on via the tailgate contact.

F25 General Vehicle Electronics

13. Seats

13.1. Front seats

The following front seat versions are available for the F25:

- Power front seats (driver's seat with memory)
- Sports seat, electrical; driver's seat with memory

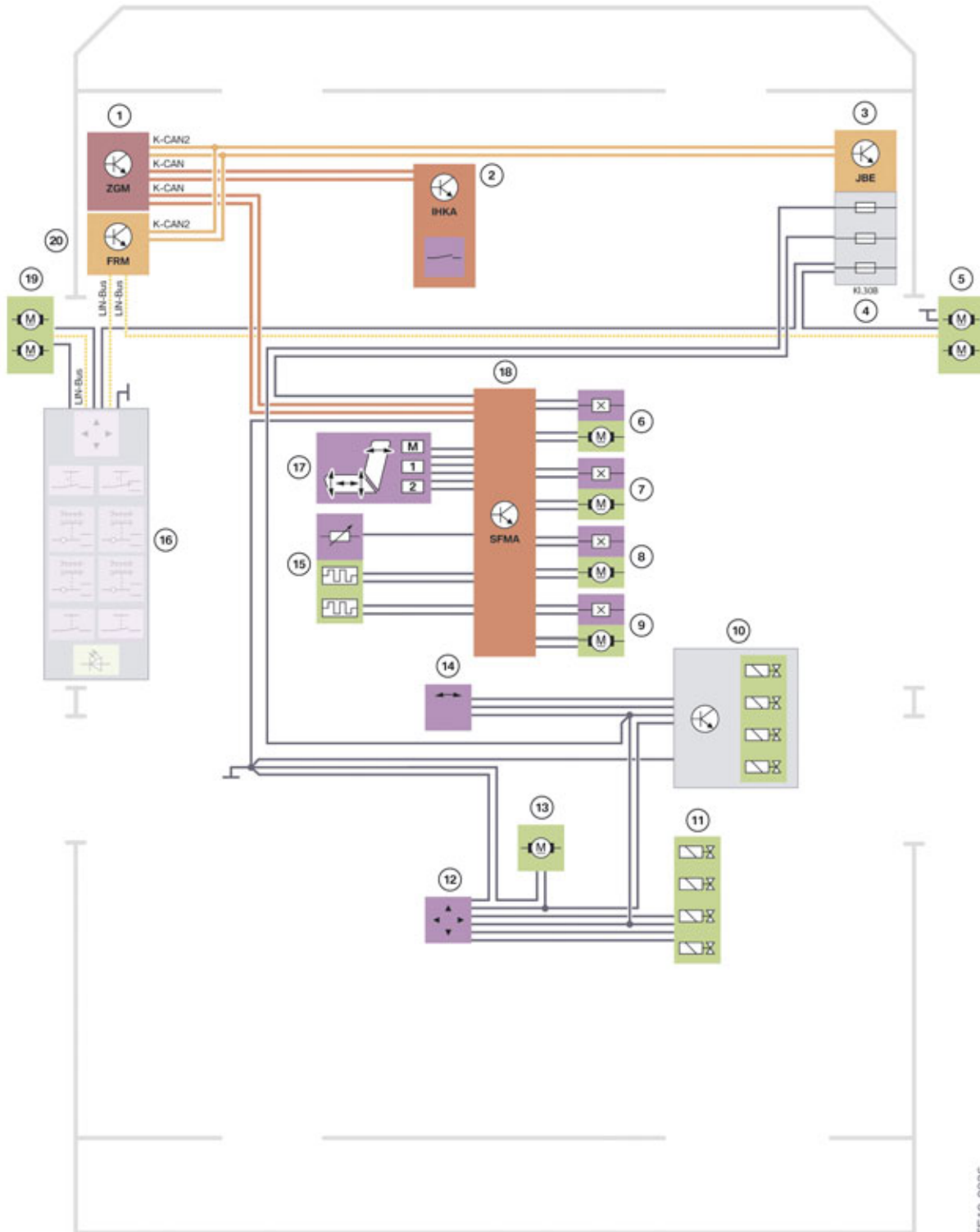
The following table provides an overview of the available optional equipment (SA).

	SA
Power front seats with memory	Standard 459
Sport seats for driver / front passenger	Option 481
Seat heating for driver / front passenger	Option 494

F25 General Vehicle Electronics

13. Seats

13.1.1. System wiring diagram



F25 System wiring diagram of driver's seat, electrical

TE10-0926

F25 General Vehicle Electronics

13. Seats

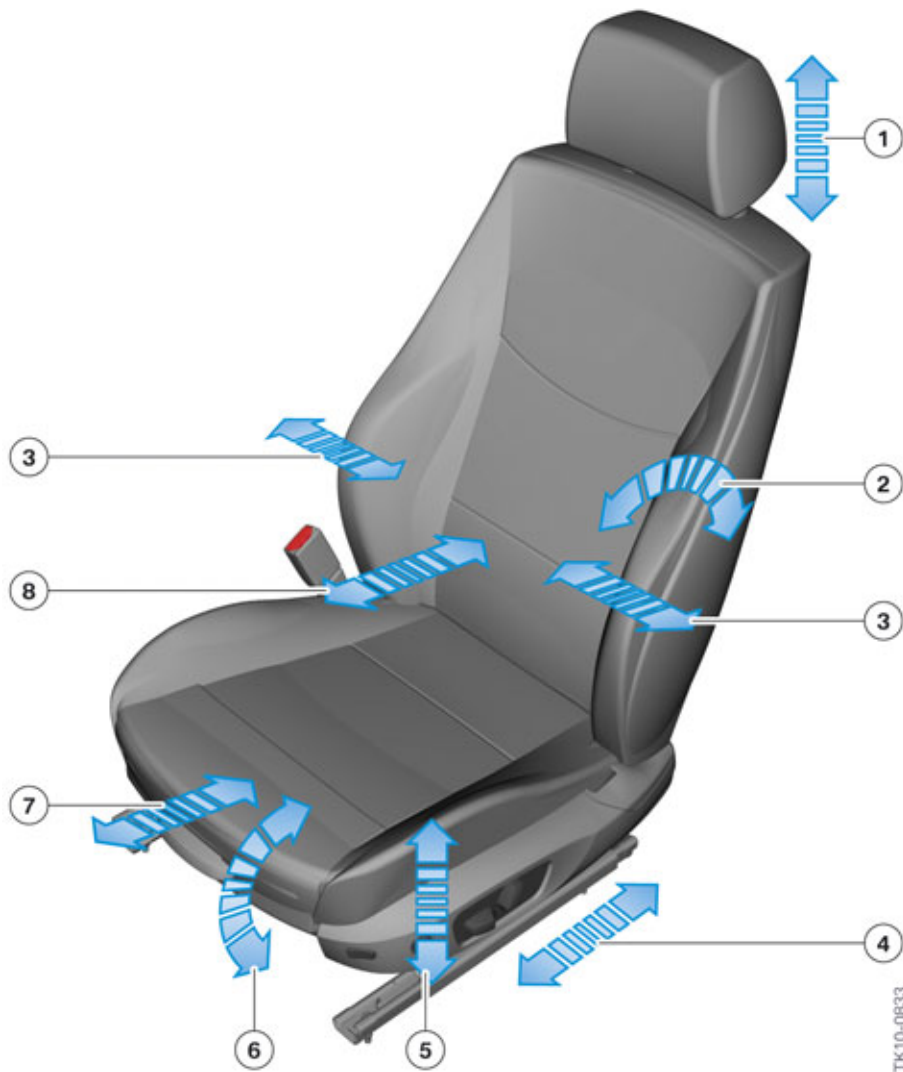
Index	Explanation
1	Central gateway module (ZGM)
2	Automatic integrated heating and A/C control unit IHKA
3	Junction box electronics (JBE)
4	Junction box for the power distribution box
5	Exterior mirror, front passenger side
6	Electric motor, forward/back seat adjustment
7	Electric motor, seat angle adjustment
8	Electric motor, seat height adjustment
9	Electric motor, backrest angle adjustment
10	Solenoid valves, backrest width adjustment
11	Solenoid valves, lumbar-support adjustment
12	Switch for lumbar-support adjustment
13	Lumbar support pump
14	Switch for backrest width adjustment
15	Seat heating
16	Switch block, driver's door
17	Switch block, seat adjustment
18	Driver's seat module SMFA
19	Exterior mirror, driver's side
20	Footwell module FRM
Kl. 30B	Terminal 30, time-dependent
LIN-Bus	Local interconnect network bus

13.1.2. Seat adjustment

The seats of the F25 can be adjusted backwards or forwards in eight directions with the maximum equipment specification.

F25 General Vehicle Electronics

13. Seats



F25 Maximum seat adjustment

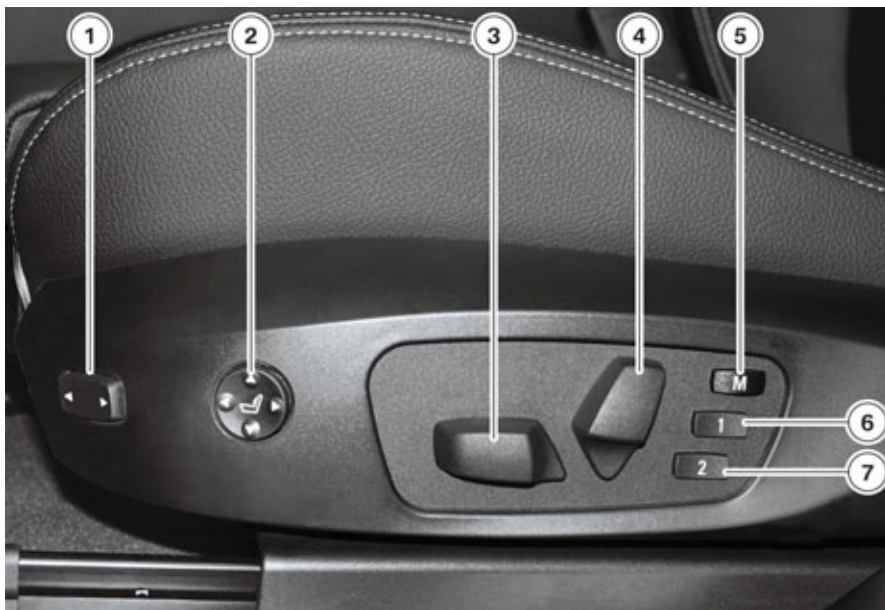
Index	Explanation
1	Head restraint height adjustment
2	Backrest angle adjustment
3	Backrest width adjustment
4	Forward/back seat adjustment
5	Seat height adjustment
6	Seat angle adjustment
7	Seat depth adjustment
8	Lumbar-support adjustment

F25 General Vehicle Electronics

13. Seats

Seat adjustment options	Electrical seat adjustment, driver's seat with memory
Seat height adjustment	electrical
Forward/back seat adjustment	electrical
Seat angle adjustment	electrical
Backrest angle adjustment	electrical
Head restraint height adjustment	manual
Seat depth adjustment	manual ¹
Backrest width adjustment	electrical ¹
Lumbar-support adjustment	electrical

¹ Only in conjunction with optional equipment Sports seats for driver/front passenger (SA 481).



F25 Driver's seat adjustment (at seat), sports seat with memory

Index	Explanation
1	Backrest width adjustment
2	Lumbar-support adjustment
3	Forward / back, seat height and seat angle adjustment
4	Backrest angle adjustment
5	Button M (stores current position)
6	Button 1 (calls up stored position)
7	Button 2 (calls up stored position)

F25 General Vehicle Electronics

13. Seats

13.1.3. Seat heating



F25 IHKA control panel

Index	Explanation
1	Button for seat heating, driver's seat
2	Button for seat heating, front passenger seat

13.1.4. Crash-active headrest

Each of the front seats is equipped with a crash-active headrest. This is a head restraint with a pyrotechnic actuator that optimizes the distance and height of the headrest in relation to the head if a rear-end collision of sufficient force occurs. This reduces the load on the cervical vertebrae in the event of a rear-end collision.



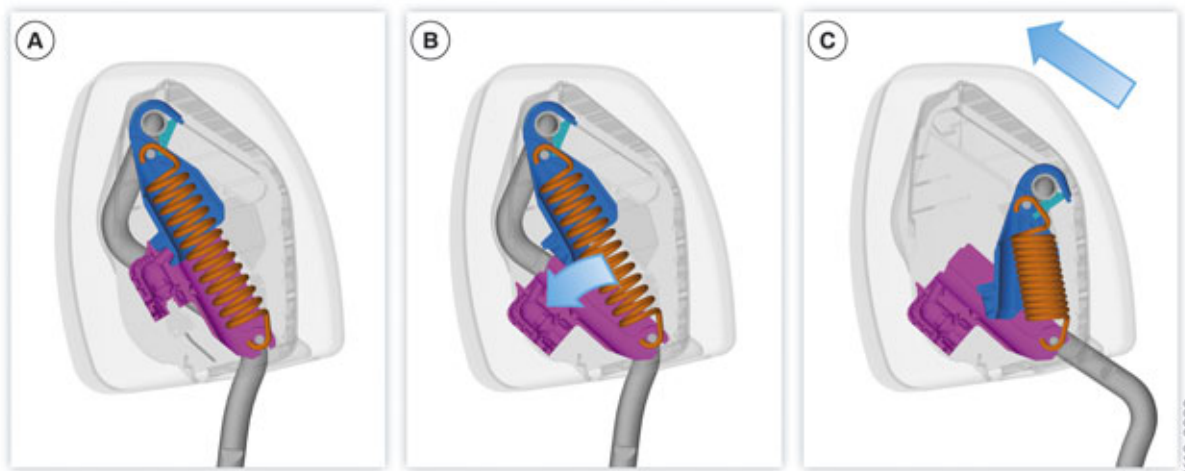
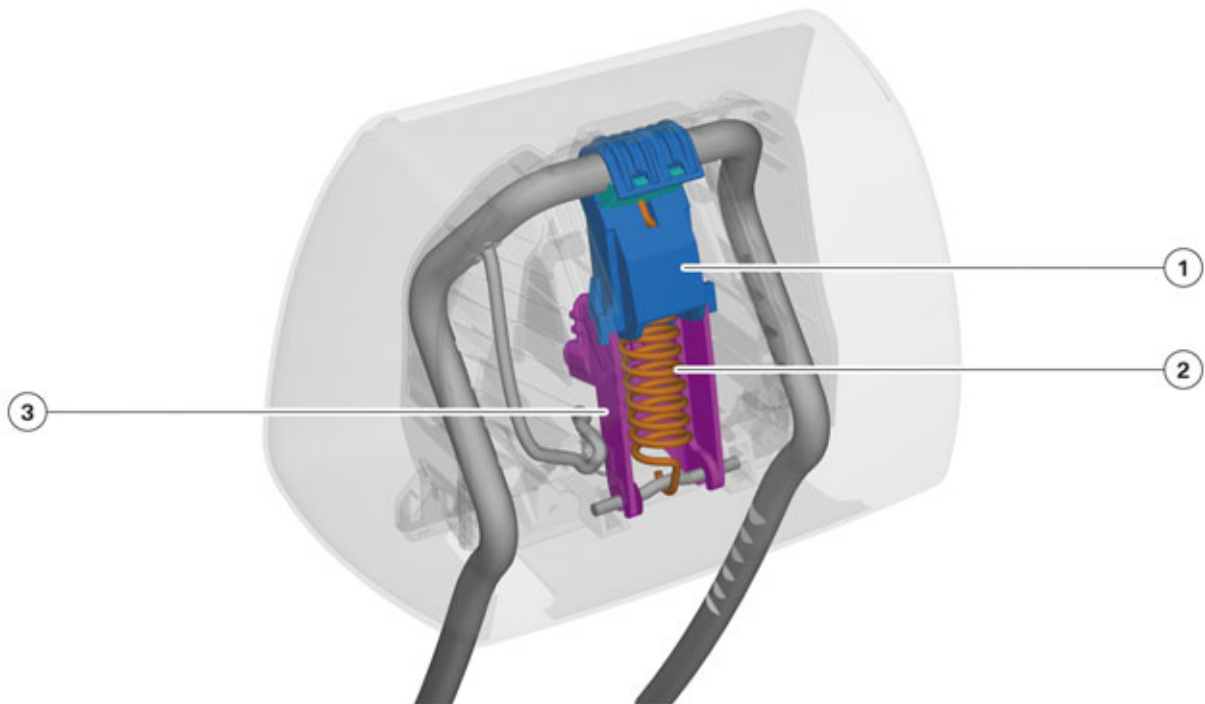
If the active head restraints have been triggered, the pyrotechnic actuators must be replaced in the workshop. Please refer to the repair instructions.



Seat or head restraint covers and/or accessories that could impair the protective effect must not be mounted on the head restraints.

F25 General Vehicle Electronics

13. Seats



F25 Crash-active headrests

Index	Explanation
A	Driving position
B	Support activates
C	Crash position
1	Support, upper part
2	Tension spring
3	Support, lower section with pyrotechnics

F25 General Vehicle Electronics

13. Seats

The head restraints are adjusted via pretensioned tension springs. If the Crash Safety Module detects a rear-end collision, the pyrotechnic actuators are energized and the pretensioned tension springs are enabled.

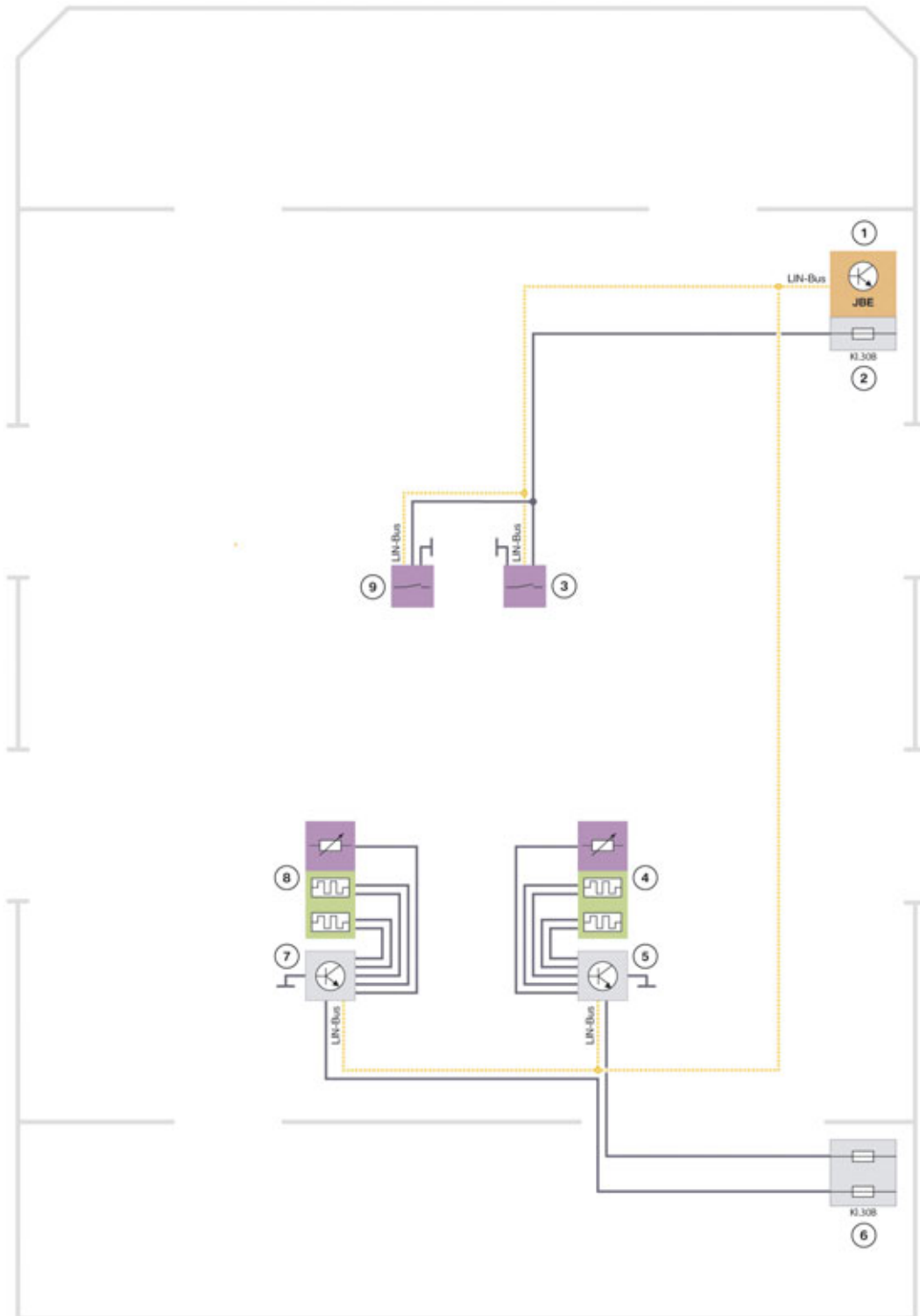
13.2. Rear seats

The rear seat backrests in the F25 have a 60/40 split as standard. A seat heating system (SA 496) and through-loading system with a center section that folds down separately and a 40/20/40 split (SA 465) are available as optional equipment.

F25 General Vehicle Electronics

13. Seats

13.2.1. System wiring diagram



F25 System wiring diagram for seat heating, rear seats

TE10-0927

F25 General Vehicle Electronics

13. Seats

Index	Explanation
1	Junction box electronics (JBE)
2	Junction box for the power distribution box
3	Seat heating button on front passenger side, rear
4	Seat heating on front passenger side
5	Seat-heating electronics on front passenger side
6	Luggage compartment power distribution box
7	Seat-heating electronics on driver's side
8	Seat heating on driver's side
9	Seat heating button on driver's side, rear
Kl. 30B	Terminal 30, time-dependent
LIN-Bus	Local interconnect network bus

F25 General Vehicle Electronics

14. Heating and air conditioning systems

Integrated automatic climate control IHKA is available for the F25.

- 2/1-zone IHKA (SA 534)

The first number denotes the number of controllable temperature zones (temperature selector wheels) and the second denotes the number of controllable air volume and air distribution zones (separate fan settings).

Both versions are based on the E83 heating and air conditioning systems.

14.1. Equipment

	IHKA 2/1-zone
Separate temperature control, front left/right	X
Independent ventilation system	X
Anti-misting	X
Fresh air filtering (microfilter)	X
Automatic air recirculation control (AUC)	X
Individual automatic control with 5 intensity levels	X
Solar compensation	X
ALL function (driver's settings are transferred to front passenger)	X

Highlights

The F25 features rapid cooling and heating response with a greater degree of comfort in terms of acoustics and customizing.

- **Optimized air flow rate**
The entire volume of air in the vehicle can be replaced up to 3 times a minute.
- **Fresh air/recirculation**
Air is filtered through interaction with an automatic air recirculation control sensor which also continuously monitors the quality of the intake air. This ensures that pollutants do not enter the vehicle interior when driving in towns or through tunnels. The incoming fresh air is also cleaned by a carbon filter. Air is also filtered in air recirculation mode to prevent soiling of the heating and air conditioning system components and vehicle interior and also to ensure hygienic operation of the system.
- **Solar and condensation sensor**
A combination sensor integrated into the mirror base determines the angle of incidence and the intensity of solar radiation. This means that the automatic integrated heating and A/C control unit IHKA can maintain an even and pleasant temperature in the passenger compartment even when solar radiation is present. The IHKA can reliably prevent fogging of the window glass through selective control intervention by measuring the surface temperature of the windscreen and air humidity.

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14. Heating and air conditioning systems

- **Climate styles and layering function**

When the IHKA is in AUTO mode, the customer can adjust the amounts of air according to his individual comfort requirements using five different "climate styles" without exiting AUTO mode. The ventilation temperature (oncoming flow at upper body) can be adjusted individually via the layering function.

14.2. 2/1-zone IHKA

The 2/1-zone IHKA is standard on all F25 models.



F25 Control panel of 2/1-zone IHKA

The 2/1-zone IHKA the temperature can be controlled on the left and right side separately.

The current driver temperature setting can be transferred to the front passenger side by pressing the "ALL" button.

The 2/1-zone IHKA also features automatic air recirculation control (AUC). This means that fresh air containing odors or pollutants is blocked. The interior air is then recirculated.



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